The Importance of Accountability in IT Governance Practice in the Public Sector:

A Case Study of the Kingdom of Bahrain

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Abstract

The term IT Governance (ITG) is widely understood to be inherited from the discipline of corporate governance and represents the way organizations structure and manage IT resources. Researchers in the discipline of ITG have shown a link between effective ITG and organizational performance. However, other research efforts continue to develop models of ITG. Another research area has focused on ITG concepts and dimensions, namely: structure, process and people. Yet, little research has addressed the implementation of ITG stage leaving a clear gap between the theoretical musings, real-life and contemporary practice. A number of researchers have reported that the adoption of ITG is believed to improve organisational accountability, thereby resulting in return on investments. Accountability is an important part of ITG especially since public sector organizations are non-profit and IT projects are considered important.

For the purpose of conducting this research, a review of the literature in ITG has been initiated to shape the intended theoretical background of the study. The academic literature conducted formalized a richer view to the ITG concept. The study investigated ITG practice using multiple case studies from public sector organisations based in the Kingdom of Bahrain. The research is also focused on gaining an in-depth insight to evaluate ITG practices. A facilitative framework has been adapted for mapping ITG areas introduced by the ITG Institute using the COBIT framework to structure the research tool. Research results are classified into most significant (mature) and weakest processes to provid a better understanding of the gaps available within ITG practice in public sector organisations covered in this study. The researcher found that IT structure in public sector organisations needs revisting to enable to better disseminating of IT activitities, therefore lead into promoting an accountability culture through definite roles and responsibilities. In addition, the researcher pointed to the enacting forces and the importance of IT-related laws in defining internal controls and protecting the organization's assets from IT-related risks. In this research, SHIP-ITG model and its maturity criteria represents a contribution of this research study for both practitioners to use and researchers; for instance, this allows the organization to gain a better perspective on ITG processes and provides a clear focus for management. The SHIP-ITG model also forms a basis for further research in ITG adoption models and bridges the gap between conceptual frameworks, real life and functioning governance.

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Publication & Conferences

This gives an account of the research undertaken by the author. Some of the materials contained herein have been accepted and presented, as follows:

- Paper 1: Accepted and presented a research paper in Proceedings of the 2nd British Computing Society International IT Conference, Abu Dhabi, United Arab Emirates, 9-10 March 2014. Paper title: **"**IT Governance from Theory to Practice: The importance of accountability". Available at: http://dx.doi.org/10.14236/ewic/bcsme2014.10

- Paper 2: Accepted and presented at the World Symposium on Computer Applications & Research (WSCAR 2015), from 23-24 March2015, in Rome, Italy. Paper title "A conceptual Model for IT Governance: A case study research"

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- Paper 4: Accepted and presented for the Fourth Generation Communication Technologies (FGCT 2015) held in London on 29-31 July 2015. Paper title: "A conceptual Model for IT Governance in Public Sectors".

Chapter 1

Introduction

It is becoming increasingly difficult to ignore the importance of information technology (IT) in leading any business. Organizations are growing and depending intensively on IT infrastructure. The domain of IT was for a long time governed mainly by IT professionals. To a great extent, organizations need information stored and operated through an IT structure. Therefore, it is necessary for organizations to know the drivers to obtain the optimal benefit from IT, such as monitoring, accountability, value delivery, structure, relational mechanisms and performance management. Among these are public sector organizations that deal with delivering services on behalf of the government. The term “IT Governance” is inherited from the discipline of corporate governance and understood to represent the way organizations structure and manage IT Resources, such as people, applications, information and infrastructure. Associations and regulatory bodies form IT Governance frameworks with distinct objectives including IT control structure, security, quality of IT services and protection of IT investments. All these are vital for endorsing IT sustainability and conveying the organization's objectives.

The increased attention on IT Governance has led to the development of this phenomenon. IT Governance is cited as a strategic issue with demand at the commitment strategic level. IT Governance is further related to the IT decision-making authority, organizational structure, processes and relational mechanisms that produce the alignment between business and IT. The focus of IT Governance has been extended and improved to ensure the accountability of IT resource usage and therefore IT delivers value to business and is aligned with achievement of

the organization's goals (Andrews, 2008, Clementi et al., 2006, Lazic et al., 2011, Webb et al., 2006).

This dissertation follows a case-study design, with in-depth analysis of five public sector organizations based in the Kingdom of Bahrain. The study was conducted in the form of a survey, with data being gathered via face-to face interviews and a web-based tool. The research used the descriptions of COBIT4.1 maturity model. The maturity level for each organization is calculated through adopting a number of functions to facilitate the calculation of the maturity level for each organization.

The overall structure of the study takes the form of seven Chapters, including this introductory Chapter. Chapter Two begins by laying out the theoretical dimensions of the research, and looks at how accountability is important in IT Governance. The Third Chapter is concerned with the methodology used for this study. The Fourth Chapter presents the IT Governance conceptual model and looks at how this concept evolved from a basic IT Governance structure. Chapter Five reviews the case study research and then Chapter Six analyses the results of the interviews. Chapter Seven presents the discussion and research findings, research conclusions and limitations.

The next section briefly reviews the background and the studies that informed the research. The subsequent sections will outline the importance of the research and potential findings, methodological approach to answering the research questions and contribution to knowledge.

1.1. Background

The IT Governance domain captured the attention of both practitioners and academics because this governance ideal remained somewhat convoluted and confused (Peterson, 2004a). Intensive research then carried on investigating the domain of "IT Governance". For instance, (Olson and Chervany, 1980) conducted research to verify how organizations structure, monitor and evaluate their IT functions and the study was under the label of "control of IT services". The first appearance in academic literature of the term was not addressed directly as "IT Governance" until the early 1990s (Loh and Venkatraman, 1992). Later that decade,

introductory studies began (Brown and Sharon, 1994), (Sambamurthy and Zmud, 1999) and then the foundation of the IT Governance Institute (ITGI) in 1998 (De Haes and Grembergen, 2005).

The concept of governance is not a new issue and has been developing since the 1990s and its dimensions have gradually been emerging. The root of this rising movement originated in the business sector after a major corporate collapse and the need for legislation and regulations, such as the initiatives taken by the Committee on Sponsoring Organizations of the Treadway Commission (COSO) in the USA and the Cadbury Committee on Corporate Governance in the UK (Vinten, 2001, Vinten, 1998). Another movement was when concerns with corporate governance led to the introduction of legislation, such as the Sarbanes-Oxley Act (SOX 2002) in the US which applies to companies trading on the stock exchange. Later, the importance of corporate governance concept to public authorities resulted in important documents of government governance, such as the Guidelines for Internal Control Standards for Public Sector and the definition of the COSO's Internal Control and IIA's (Institute of Internal Audit) definition of Internal Audit (INTOSAI, 2004). IT managers must be aware of the critical IT risks and its controls for significant decision-making over IT.

The increased attention on IT and its importance to sustain business growth has led to the emergence of international organizations on governance in the area of IT, therefore resulting in IT Governance. One of the most significant discussions in the standards-based frameworks was developed and sponsored by the Information System Audit and Control Association (ISACA) and Information Technology Governance Institute (ITGI). A number of researchers have reported on the three most adopted standards, COBIT (Control Objectives for Information and Related Technology), ITIL (Information Technology Infrastructure Library) and ISO (International Standard Organization)17799:2000 (Denise and Dieter, 2010, Spafford, 2003); these standards will be further discussed in the Literature Review Chapter (Chapter Two) in the thesis. However, some studies claim that there is extensive literature on IT Governance and most is theoretical in nature (Jordan and Musson, 2004, Bowen et al., 2007, Artur, 2009, Lynn and Robichau, 2013). In fact, the literature sees IT Governance as either a structure or process and leaves a clear gap between theoretical framework and contemporary practice (Jordan and Musson, 2004, Ribbers et al., 2002).

Emerging themes in this relatively new discipline of IT Governance have shown a link between effective IT Governance and organizational performance illustrating the importance of organizational structures and processes as the responsibility of the board of directors and executive management (Ross and Weill, 2004c). (Dahlberg and Kivijarvi, 2006) argued that an IT Governance framework should be built on alignment of business and IT and should address an integral part of corporate governance. Other research efforts focus on the development of models of IT Governance to enable researchers and practitioners to better understand the different components and dimensions of the concept and its relationships. Consequently, this will impact on a better envisioning and practicing of this important concept. Several attempts have been made, for instance, a framework for managing the relationship between the IT organization and the rest of the business (Peppard, 1999), the Three-Tiered IT Governance (De Haes and Grembergen, 2005), Extended IT Governance Model (Grant et al., 2007) and Complementary and collaboration IT Governance Model (Denise and Dieter, 2010). The full discussions of these models are presented in Chapter Four. The studies commonly demonstrate IT Governance as a mix of structures, processes and relational mechanisms. So far, however, there has been little research discussing the implementation of the IT Governance stage which has left a clear gap between the theoretical musings, real-life and contemporary practice (Grant et al., 2007).

It is widely accepted that Information Technology (IT) is fundamental for sustaining business growth and innovations as presented in the work of (Peterson, 2004b). IT acquired a critical role in improving Corporate Governance practices because understanding the current challenges of the IT portfolio can enable the organization to better diagnose and design IT Governance architecture for future performance development. For instance, in 1997 Ralph Larsen, CEO of Johnson & Johnson launched corporate-wide cost-cutting as he was spending millions annually on IT, yet not getting the business information and value needed. Therefore, Johnson & Johnson established a new job and mission to standardize systems, cut IT costs and align the IT organization with business strategies.

The relationship between IT cost and value has been widely investigated (Van Gils, 2005, Flores et al., 2011, Janssen et al., 2013, Considine, 2002). In this scope the authors Ross and Weill(2004a, p.17) state that “IT value depends on more than good technology”. Similarly,

Webb et al.(2006, p.3) state an example that "IT baseline costs are significant and rising". Some countries, for instance organizations in North America and Western Europe, have increased investment in IT and focused on ensuring that IT delivers value at around 4.2% of the annual revenue (Clementi et al., 2006). A recent example reports that governments in the Middle East & Africa will spend US $11.9 billion on IT products and services in 2014, an increase of 2.3 percent over 2013 revenue of US $ 11.7 billion, according to 'Gartner' journal (Shetty, 2014). As another example, government spending on information technology in India is expected to rise 5.7% to $6.8 billion in 2015 as reported in 'The Economic Times' journal (Neha Alawadhi, 2015). As a consequence, IT spending is continually rising, with the worldwide IT spending trend set to total $3.8 trillion in 2015, which is a 2.4% increase from 2014 (Stamford, 2015). Therefore, these figures illustrate the extent of how organizations need to protect information assets from potential disaster. This fundamental importance of IT can hardly be refuted.

IT Governance is cited as a strategic issue and relates to IT decision making/leadership capabilities (Ross and Weill, 2004a, Peterson, 2000a, Grembergen, 2004b, De Haes, 2009, Grembergen, 2003). Associations and regulatory bodies formed IT Governance frameworks with distinct investment (Mohamed and Singh, 2012, ITGI, 2007, Larsen et al., 2006, ITGI, 2003). All are vital for endorsing IT sustainability and conveying the organization's objectives. Yet, current literature reflects a lack of maturity and points to diverse and inconsistent concepts of IT Governance (Denise and Dieter, 2010, Webb et al., 2006).

1.2. Background to previous IT Governance studies

For the purpose of conducting this research, a number of pertinent previous studies in this area have been reviewed. Most studies in the field of IT Governance have only focussed on a narrow or specialized area; yet, the holistic view of IT Governance practice in the public sector was not investigated. For instance, A.Mylonopulos (1997) investigated the governance of information technology service provision which follows elements of the structure and process of contracting with a focus on the concept of IT outsourcing practice and contracting out for an effective delivery of IT service. Case study method was adopted using two cases.

The data collection process involved a variety of written documents, interviews, presentations and discussions with IT managers across the organisation of British Petroleum Plc. The aim of the research was to make a contribution to the understanding of the management phenomenon of outsourcing and recommending the necessary improvements.

Another study by Navarra (2006) introduced global ICT programmes in Jordan as new and universal modes of organizing mediated by technology and enacted through a novel mix of policy and international instruments. The case study of Jordan's e-government investigated two services: e-accounting and e-procurement. The study showed that the capacity of the government to retain control within the changing boundaries and governance of the state should not be addressed just by looking at how the government can control and regulate directly its development, rather to steer and enable networks that can achieve the goal of state governance. A significant finding reported in the study indicated that ICT is essential to increase transparency and accountability of government agencies. Another significant finding reported that better accountability and improved transparency are identified as characteristics of good governance.

A further study was conducted to identify the relationship between record management and the accountability of governance. The study argues that the failures in the accountability, transparency and trust are a consequence of an individual actor or a group of people who breached the trust placed in them in record management (ISA, 2009). Case study method has been conducted in three different organisations based on selecting best practices in the public sector: NHS, European Investment Bank and Standard Life Plc. The study argues that an essential part of the risks exposed with record destroying and preserving in case accountability is not in place. This indicates a need to understand the various perceptions of poverty that exist among accountability in IT Governance.

Although extensive research has been carried out on Information Technology, few studies have been able to draw on IT Governance assessment in public sectors and the holistic view of its concept. The research discussed by Simonsson (2008) gave a more efficient approach to our research in investigating IT Governance practice; however, the study argued that the COBIT framework was not sufficient in meeting the requirements proposed. The criticism introduced was related to specific research objectives and aims. Alternatively, Simonsson

(2008) presented the IT Organization Modelling and Assessment Tool (ITOMAT) for collecting the metrics of IT Governance maturity and performance from case studies. Other studies reviewed so far tend to overlook the use of the COBIT maturity model (Simonsson et al., 2007, Vargas, October 2010, Brown and Sharon, 1994, Flores et al., 2011). Difficulties arise, however, the COBIT assessment tool used in our research proved its adequacy in meeting our research aims.

So far there has been little discussion about the importance of accountability in IT Governance and models for the public sector. The research aims to provide a conceptual framework for IT Governance in the public sector from both the analysis of theory and practice of IT Governance using the Kingdom of Bahrain as a case study. The research target participants are selected from the public sector (academic, health, education, allocation of services). IT Governance practice will be examined using an adapted COBIT maturity model, therefore, IT Governance maturity level for each participant case study will be presented. This will also allow further analysis to conduct and identify gaps for a set recommendation.

1.3. Importance of Research and Potential Findings

The Kingdom of Bahrain has lately seen significant motivation at the national level to improve the quality of life for citizens in the Information Technology domain. This can be seen from the initiatives for improving services in the use of Information and Communication Technologies (ICT) established through private and government sectors. It is also apparent that eGovernment Authority in the Kingdom of Bahrain is taking an important role and has become responsible for coordinating and executing eGovernment initiatives in line with the strategies, plans, and programs set by the Supreme Council for Information Communication Technology (SCICT). Conducting innovative initiatives is related to enterprise architecture. The aim is to prevent duplication of efforts in the implementation of eGovernment projects, to increase the efficiency of technology architectures and their contribution to maintain efficient exchange of information among government entities and reduce prolonged time wasted in various government transactions and procedures. Many readiness procedures are prompted toward deploying these initiatives; these include forming a higher committee for supervision of the government sector organisations and reviewing the status of IT projects performance,

hosting annual International Forums for e-Government, reducing the cost of services delivered to the beneficiaries, setting up international standards for government websites and providing training on both building IT strategy and security ((NEAF), 2007, (NEAF), 2012, Portal, 2013). As a result, the IT Governance research field will have a significant impact on the country because the country is currently moving to the stage of planning, building and running the developed services; therefore the next stage is the IT Governance (see Figure 1.1: Step up process for IT Governance stage). The IT Governance stage includes a decision making model that allows the integrated decision-makers to exercise their authority to direct, monitor and evaluate their IT related projects.

If the debate is to move forward, a better understanding of IT Governance needs to be developed. Further research should therefore concentrate on the impact and outcomes of these national initiatives. A number of forces are driving the need in the IT Governance domain; such as the development of compliance requirements, increases in the security threats landscape, economic unpredictability and organisational agility.

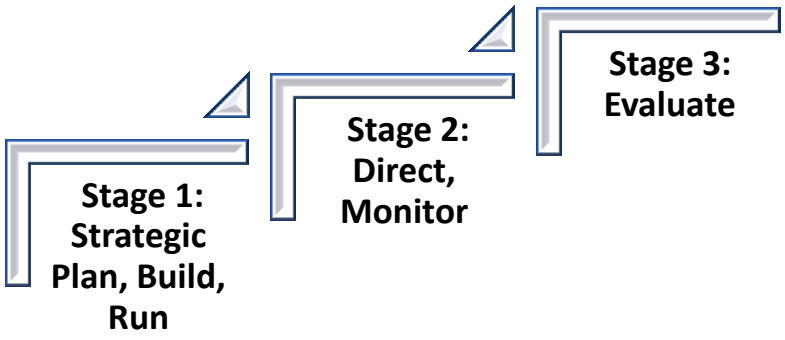


Figure 1. 1: Step up process for IT Governance stage

Therefore, a clear model for IT-related decisions to balance benefits cost and risk and ensure better alignment of IT investment with strategy and improve the overall agility of the business process is definitive.

For the purpose of this study, my research is informed by studies conducted on the country level as in Awamleh (2011) and introduces a survey on eGovernment applications in a sample

from the University of Bahrain community (500 completed). His major outcome was to use the Internet as a media for eGovernment. He points to the rise of information society which has led to major changes in citizen expectations and organizational structures, culture and working process. He concluded that a balance between technology and Governance is needed (Awamleh, 2011).

Another study is Hussain and Mallin (2002); their analysis was of the existing corporate governance state in Bahrain. They conduct a survey on all companies listed on the Bahrain Stock Exchange Market. The focus of the study is on risk management and control. Overall, they found that Bahraini companies have a number of key corporate governance structural features in place, but future progress must be made. One year later, they continued to study the dynamics of corporate governance in Bahrain and analysed that the board structure of the companies is key to the adoption and implementation of corporate governance. They reported some encouraging features and developments in corporate governance within companies listed on the Bahrain Stock Exchange Market (Hussain and Mallin, 2003).

Ebrahim (2005) investigated the adoption of e-government and the impact of e-government on government organisations. The researcher studied the e-government phenomenon within multiple case studies (three government entities) in the Kingdom of Bahrain. His research has led to the development of a framework for e-government adoption that illustrates the implementation process and critical factors influencing the barriers that could restrict the process of adoption.

Therefore, this research is unique in that it covers IT Governance in the public sector from a holistic view of the practice in the Kingdom of Bahrain. Moreover, the research aims at examining the work of the National ICT Governance Committee establishing goals, who will be responsible for setting high eGovernance standards for the deployment and utilization of ICT projects in the government entities, reviewing strategies, monitoring financial cost of ICT projects and reporting to the Supreme Committee for Information and Communication Technology (SCICT) in this respect for necessary action (News, 2011). This national committee as well as the eGovernment Authority in Bahrain are the candidate bodies that this research will feed into because the Ministry of Education (the sponsor for this study) is a member of both the National ICT Governance Committee and the SCICT.

1.4. Research Motivation

The author's role as a Senior Computer Quality Control Specialist at the Ministry of Education (MoE) in the Kingdom of Bahrain qualified her to get insights into the actual gaps available in IT management and processes. Examples of some observations are related to the process of collecting and managing IT equipment requests with ambitious specification procedures and communication channels between the stakeholders and IT Directorate resulting in delays and therefore, claims and job discontinuity problems. IT support services are partially outsourced and delegated to other companies to cover the huge number of clients among distributed geographical locations. This requires a system and a policy to handle the problems of request queues especially the ones considered in urgent categories. Similarly, this also reveals another problem of controlling IT assets. Many projects arose with several major obstacles, such as training, business integration, poor performance levels and resistance to change. Another concern is related to IT risks and security because the organisation community is huge and covers different skills and they need awareness, policies and training. The IT related decision making is structured centrally and is assigned to the IT Directorate of the MOE. In fact, the increased use of IT in the organisation led to a need in how to manage and control the expanded use of IT.

As stated in the previous section, the Ministry of Education is a vital member in two Committees; the National ICT Governance Committee chaired by eGovernment Authority CEO Mr.Mohammed Ali Al Qaed and the SCICT chaired by His Highness Shaikh Mohammed bin Mubarak Al Khalifa- Deputy Prime Minister. Therefore, the research results with recommendations will be reported to these committees. The researcher stated the procedure of delivering and transferring IT Governance knowledge to the presenter of the Ministry of Education in the National eGovernance Committee, the Assistant Undersecretary for Planning and Information.

1.5. Research Context

According to Yin (2009), a research design is defined as "a logic that links the data to be collected and the conclusions to be drawn to the initial questions of study". Therefore, the research design is the logical sequence or plan to guide the researcher to answer the defined questions and objectives. The significant stage of research design is the methodology selection showing the justification of research strategy, methods and unit of analysis. Then, the research design is transformed to a plan of actions to assist the researcher in data gathering for the unit of analysis (as illustrated in Figure 1.3).

The concept of IT Governance has emerged as a result of its important relationship to information technology, where IT activities have become strongly aligned with business. Alignment is important in light of the business continuity and the link of business and IT. This is an expected consequence of the dependency upon IT-based systems and more business being conducted in a computer-mediated environment. Researchers began exploring the fusion between business and IT (J.Peppard, 1999, De Haes, 2009, Luftman, 2000) and others investigated the impact of IT Governance adoption (Buchwald et al., 2014, De Haes, 2009, Lynn and Robichau, 2013, Xue et al., 2008, Lazic et al., 2011). IT is essential to increase the transparency and accountability of the organisation and public sector organisations are more exposed to the risks of being held to account for their actions. The previous research tended to focus on accountability processes in record management as evidence of business transactions and they argue that government organisations should not focus on structures but on business processes (Meijer, 2007, Meijer, 2001, Brennan et al., 2008, Bearman, 1993). So far, there has been little discussion about the importance of accountability in IT Governance for public sector organisations.

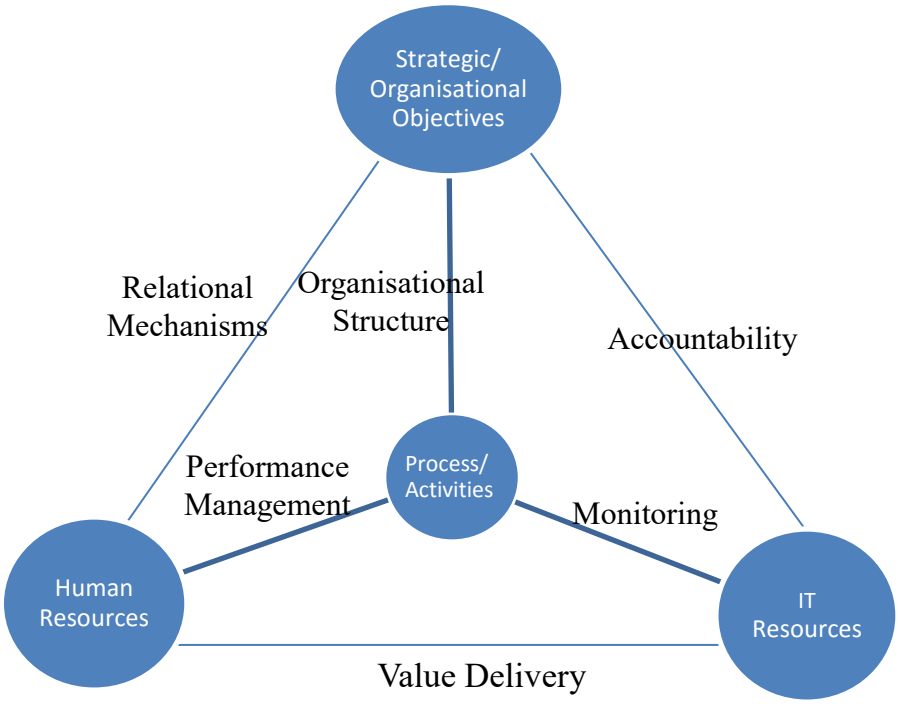


Figure 1. 2: IT Governance Model (SHIP-ITG Model)

The aim of this research is to explore different perspectives and comprehension of participants within the subject context that is "IT Governance" to recognize each experience of the same situation. Consequently, this research explores IT Governance Practice from different experiences by approaching multiple cases in the public sector (Five organizations). IT Governance studied in a natural setting or "lived reality" generated the relevant theory from understanding the IT Governance practice and facilitated the development of the conceptual model (as in Figure 1.2: IT Governance Model (SHIP-ITG Model)). This research is exploratory to investigate the maturity level of each case organization in the public sector. In this interpretive study a case study strategy was adopted to investigate IT Governance processes in practice because this will provide the opportunity to investigate IT Governance practice through interviews, questionnaires and document analysis so enabling a rich insight into the different working practices of each case. The research used COBIT 4.1 assessment tool as a basis for conducting the interviews and questionnaires. The next section illustrates the use of case study strategy and data generation methods.

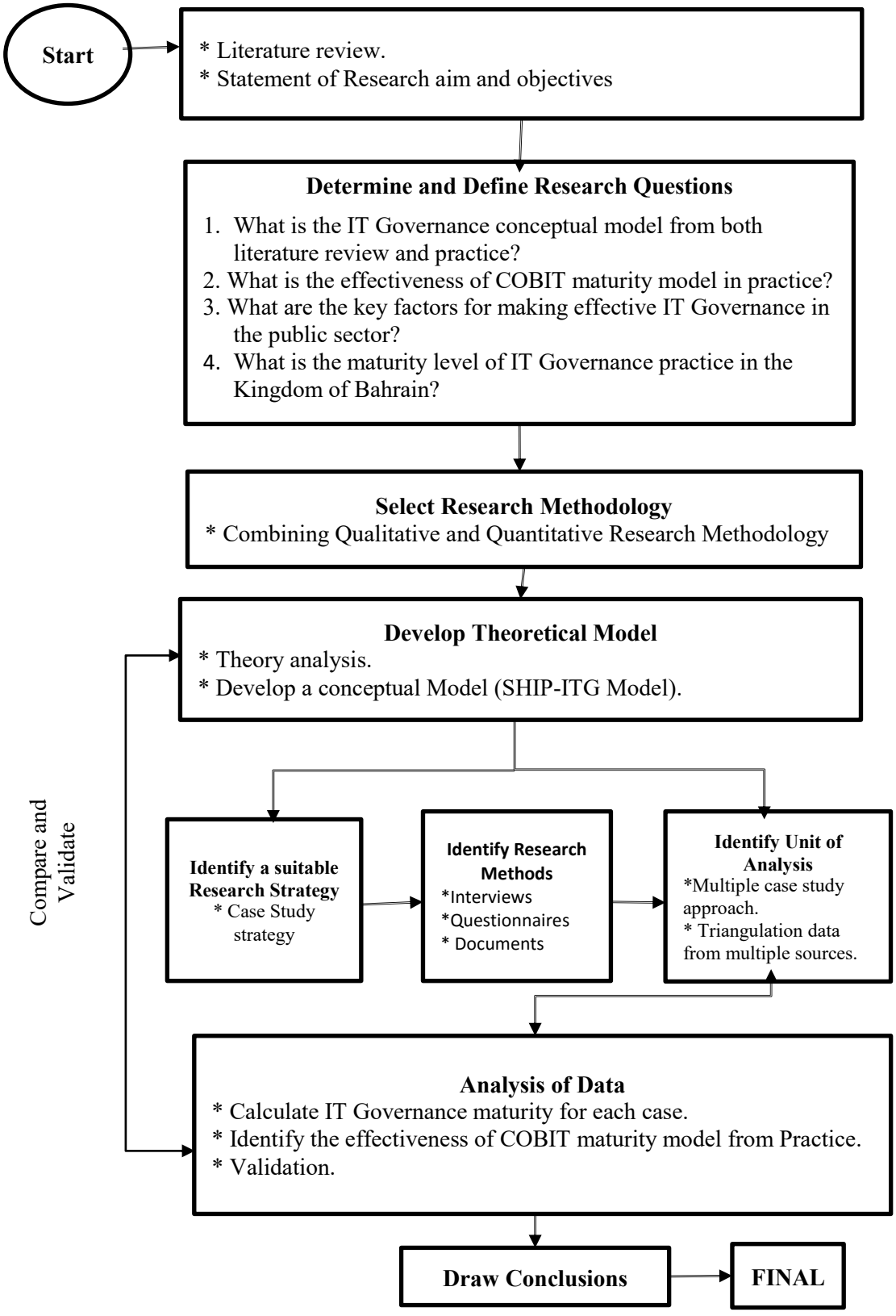


Figure 1. 3: Research Design

1.6. Research Questions

This study seeks to assess the maturity level of IT Governance in public sectors in Kingdom of Bahrain and develop a conceptual model (SHIP-ITG Model) that identifies the theoretical dimension and the importance of accountability to support the decision making process in the public sectors. Therefore, the research questions posed here are:

1. What is the IT Governance conceptual model from both literature review and practice?
2. What is the effectiveness of COBIT maturity model in practice?
3. What are the key factors for making effective IT Governance in the public sector?
4. What is the maturity level of IT Governance practice in the Kingdom of Bahrain?

1.7. Research Objectives

In order to address the research aim mentioned in Section 1.5 and research questions mentioned in Section 1.6, the following research objectives will be met:

- To review and analyze literature in the IT Governance domain to identify the theoretical dimension and the importance of accountability in the public sector.
- To develop a conceptual model from investigating IT Governance models in the literature review and practice using COBIT 4.1 maturity assessment tool survey developed by the researcher using two methods of data collection; face-to-face interviews and online questionnaire.
- To identify the benefits and barriers of IT Governance (gaps) in practice by analyzing the COBIT 4.1 maturity assessment survey.
- To identify the maturity level of IT Governance in the Kingdom of Bahrain and represent the conclusions based on the results generated from the assessment survey.

1.8. Contribution to knowledge

In this research, we take a holistic view on IT Governance practices in the Kingdom of Bahrain by empirically exploring and interpreting the practices. The IT Governance Model (SHIP-ITG Model) represents a basic structure of a concept and is considered a contribution of this research study for both practitioners to use and researchers; for instance, this allows the organization to gain a better perspective on IT Governance processes and provides a clear focus for management attention.

The previous IT Governance models explained the common elements of IT Governance concepts and scopes, however lacked the links and methods needed for implementing these concepts. Most studies in the field of IT Governance focused on presenting the elements in static view models. Therefore, this study contributes to existing knowledge in the domain of IT Governance by presenting a dynamic, interdependent and holistic model for implementing the IT Governance concept in any organization. The researcher introduced this model as the "SHIP-ITG Model", which coupled theoretical insights with practical relevance. The maturity of organizations will remain the first step to progress beyond it. The model defined the **S**trategic Objectives, **H**uman Resources, **I**T Resources and the three elements connected to the **P**rocess element, located at the centre, and explored the interconnections between them. This three dimensional representation model may also be considered as a basis for further research in the IT Governance adoption model and for bridging the gap between conceptual frameworks, real life and functioning governance. The model can be adopted in any organization starting from defining the business strategy and role of IT in the organization. Consequently, the steps are identify IT Resources, set the appropriate business processes and assign the roles to the appropriate Human Resources.

The findings from this research suggest that IT Governance requires flexibility and fluidity and not strict adherence to predetermined responsibilities and procedures, however commendable (Chan, 2002). The understanding of the IT Governance concept is important because it establishes the boundary and the scope of IT Governance processes for anticipating accountability processes.

1.9. Research Impacts: Theory to practice

The aim of this research is to transfer the IT Governance theory to practice (Janahi et al., 2014). The adoption process of the IT Governance concept is complex since it requires integration and shared efforts from decision makers in the organisation. Therefore, adopting the case study research in the Ministry of Education, a number of initiatives and blueprint ideas occurred; these are summarised as follows:

- A ministry order released in November 2014 to form the ICT Governance Committee. The most significant roles are: review IT related projects, IT strategies, control IT investments and implement the recommendation fed from the National ICT Governance Committee.
- The researcher discussed with Assistant Under Secretary for Planning and Information about the possible ways of transferring the knowledge and results to the National ICT Committee. Two tasks have been assigned to the researcher, introduce the general concept of IT Governance to the local ICT Governance Committee in Arabic. While the second task would be a workshop to practice how to implement IT Governance in the organisation.
- The researcher performed a blind test with a group of co-workers and IT Director in the Ministry of Education. The researcher placed the previous IT Governance models and the proposed model in sequence to explain the IT Governance concept. The researcher gave a brief on their participation in data collection and results. The aim of this practice was to answer the question: which model explains the IT Governance concept? And why? The researcher started by asking how you define IT Governance and found a lot of answers that were ambiguous. Then, discussed the models without revealing that the last one is the researcher's contribution. The significance in this practice is to know their feedback and see their reaction on understanding the concept. Most found that the last one is showing a clear demonstration on current IT activities in the organisation, especially including the strategic/organisational objectives element and the relations between these elements. They also found that the models looked like in a developing and improving stage.
- The researcher performed a validation test in one case study to test the SHIP-ITG Model and further details are presented in Chapter Three.

1.10. Dissertation Structure

The overall structure of this research consists of seven integrated chapters. The following paragraphs explain these chapters:

Chapter 1: Introduction

This chapter introduces the area of IT Governance by presenting the background to the topic. The importance of this chapter is it presents a review of the research.

Chapter 2: Literature Review

This chapter presents the background theory, definitions of IT Governance and IT Governance frameworks. The chapter identifies why this topic continues to garner further research.

Chapter 3: Research Methodology

This chapter is the roadmap that should be followed to convey the research process. The chapter provides research strategy, case study protocol, unit of analysis and the empirical research design followed during the research.

Chapter 4: IT Governance Conceptual Model

The chapter presents the most commonly used IT Governance model and explains the dimensions investigated. Further, the contribution of this research, the IT Governance model is presented by showing the dimensions investigated from existing literature and observing the links existing in practice.

Chapter 5: Case Study Research

This chapter presents the unit of analysis, case study protocol and case study overview. The chapter provides details of the fieldwork research procedure, case study questions and reports.

Chapter 6: Data Analysis & Results

This chapter describes and analyses the empirical data of the five case studies perspectives. These describe 18 IT processes selected from the four domains of the COBIT framework.

Chapter 7: Discussions and Research Findings

The chapter offers an empirical analysis of different case studies perspectives. In order to understand the maturity results, benchmarking is fundamental for comparative analysis and drawing conclusions. This chapter presents the main contributions of this research to the body of knowledge, theory and practice. Then it discusses the limitations of the research and recommendations are made for further research.

1.11. Conclusion

This chapter presented a background review on studies that informed this research. IT Governance is cited as a strategic issue and related to IT decision making/leadership capabilities. The researcher found that current literature reflects a lack of maturity and points to diverse and inconsistent concepts of IT Governance (Denise and Dieter, 2010, Webb et al., 2006). The researcher found that there has been little discussion about the importance of accountability in IT Governance for public sector organisations.

The researcher justified the importance of the research and potential findings and methodological approach. The research explored IT Governance Practice from different experiences and adopted multiple case study in the public sector (Five organizations). Then, the researcher outlined the overall structure of the dissertation and will be divided into seven integrated chapters. The next chapter will present a detail review of the literature on IT Governance.

Chapter 2

Literature Review

This chapter offers a detailed review and critical analysis of the literature on Information Technology (IT) Governance definitions, frameworks, maturity models and the theoretical dimensions of IT Governance. It attempts to build a background of the IT Governance context to be used in building the conceptual model presented in Chapter Four. Since the concept of IT Governance is inherited from the concept of Corporate Governance, this chapter identifies different perspectives that describe IT Governance. As IT Governance is an emerging area, there is a limitation in the literature addressing the links and methods needed for implementing this concept. Therefore, the researcher investigated the literature in the IT Governance domain to identify the theoretical dimensions and the importance of accountability in the public sector.

2.1. Introduction

This chapter presents an overview of why this topic continues to garner further research. It attempts to build a background of the IT Governance context to support the understanding of IT Governance dimensions especially building the conceptual model for IT Governance as will be presented in Chapter Four. Since the topic captured the attention of both academics and practitioners, a number of definitions are provided that explain the concept of IT Governance at the beginning of the chapter. Then the chapter moves to review the IT Governance background as part of the corporate governance. This part manifests the position of IT Governance within the organization and distinguishes between the two terms.

A number of standards and frameworks are available for adoption and disciplining the IT–related activities, therefore the researcher reviews and then moves to justify the selection of COBIT 4.1. As a newer version was released while conducting this research, the researcher then compares between the latest version (COBIT 5) and the adopted framework. The chapter then reviews the IT Governance focus areas that should be regular items on the agenda. These focus areas are defined as: IT strategic alignment, value delivery, risk management, resource management and performance management. This part extends the learning process of the IT Governance concept and enables the researcher to form the boundaries and dimensions of the concept.

As the focus of the research is on the public sector, the chapter reviewed the public sector/private sector characteristics and then moved on to discuss the different organizational structures in organizations. While considering that IT Governance is a strategic decision, the chapter explains the role of steering committees in IT-related decisions, which is proposed as a working example adopted and reflected in the environment that the researcher belongs. Finally, the chapter discusses the importance of accountability in IT Governance practice.

2.2. IT Governance Definitions

The concept of IT Governance has been a subject of debate since the late nineties and numerous definitions have been introduced in literature by both academics and professional bodies and agencies. There has been increased attention on IT Governance, heightening the development of this phenomenon especially as it impacts on many aspects of the business environment. IT Governance is cited as a strategic issue with the demand of commitment at the strategic level (Alonso et al., 2008, Hosseinbeig et al., 2011, Niu and Wang, 2010, Grembergen, 2004b). IT Governance is further related to IT decision-making authority, organizational structure, processes and relational mechanisms that produce the alignment between Business and IT (Peterson, 2004a, Norshidah Mohamed, 2012, Simonsson et al., 2010, Turel and Bart, 2014). The focus of IT Governance has been extended and improved to ensure the accountability of IT resource usage and therefore delivering value to business and is closely aligned with achieving organizational goals (Ross and Weill, 2004c).

In this research, three definitions have been retained:

- *"IT Governance is the organizational capacity exercised by the board, executive management and IT management to control the formulation and implementation of IT strategy and in this way ensure the fusion of business and IT."* (Grembergen, 2004b, p.41)

- *"IT Governance: specifying the decision rights and accountability framework to encourage desirable behaviour in the use of IT"* (Ross and Weill, 2004a, *p.8)*

- *"IT Governance is the responsibility of the board of directors and executive management. It is an integral part of Enterprise Governance and consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategies and objectives."* (ITGI 2007, p.5)

Therefore, the definitions differ on some aspects; some had a broader view and some had a narrower view. In addition, some researchers believe that this increased amount of literature published shows inconsistent perspectives and unrealized benefits of IT Governance (Wessels and Loggerenberg, 2006). Other researchers have reported that this variation might be a result of the continuously changing characteristics of Information Technology Governance and the simultaneous developments from different communities (Preittigun et al., 2012, Peterson, 2004a, Weill, 2004b, Van Grembergen et al., 2004). In fact definitions lack consensus and remain vague, being addressed by many groups of researchers (Webb, 2006, Buchwald et al., 2014). However they all have in common the integration between business and IT, usually referred to as strategic alignment and this is considered a critical element of IT Governance (Grembergen, 2004a). The definitions also explicitly state that IT Governance is an integral part of enterprise governance and covers processes and structures for decision making with a clear responsibility and accountability environment to leverage better performance from IT. It has been also observed that there is a clear difference between IT Governance and IT management; the focus of IT management is on the supply of IT services, products and operations, whereas IT Governance is much broader and focuses on present and future demand of IT and business. Some of the prevalent definitions have been illustrated in Table 2.1 to show how the context of those considerable perspectives differ upon the intention and approach to the research topic.

According to the definitions shown in Table 2.1: Definitions of IT Governance, IT Governance can be described as who is responsible for IT functions and where. Then, IT Governance is defined as shared responsibility for decision making and the integration between IT and business managers. Other research carried out supports this aspect, such as Koch (2002) who states that organizational units must be consistent in order to align IT with business objectives. IT Governance is a way of guaranteeing the delivery of the expected benefits of IT as stated by Ross and Weill (2004a). IT Governance definition has been expanded with terms ‘ensure’ and ‘sustain’ introduced by the ITGI (2003); therefore, an accountability framework is important to specify and encourage the maximum IT value and to balance risks. The definitions also present the researchers view on the importance of organizational strategies when defining IT Governance.

Definition	Authors &Reference	Type	Context of Perspective
IT Governance describes the locus of responsibility for IT function.	Brown and Magill in1994(Grembergen 2004b, p.41)	Academic	Authority for IT decisions
IT Governance is the degree to which the authority for making IT decisions is defined and shared among management, and the processes managers in both IT and business organizations apply in setting IT priorities and the allocation of IT resources.	Luftman in 1996(Grembergen 2004b, p.41)		Authority for IT decisions, IT processes and use of strategies.
IT Governance refers to the patterns of authority for key IT activities. IT Governance refers to the patterns of authority for key IT activities.	Sambamurthy & Zmud in 1999(Grembergen 2004b, p.41)		Authority for IT activities
IT Governance is based on lateral decision-making processes across corporate and local business and IT decision-making units.	Pieter M.Ribbers, Rayan R,Peterson & Marylin M.Parker (Ribbers et al. 2002, p.1)		Governing structure and process
IT Governance is the organizational capacity exercised by the board, executive management and IT management to control the formulation and implementation of IT strategy and in this way ensure the fusion of business and IT.	Van Grembergen, (Grembergen 2004b, p.217)		IT structure, processes and relational mechanisms.
IT Governance: specifying the decision rights and accountability framework to encourage desirable behaviour in the use of IT.	Jeanne Ross & Peter Weill (Ross and Weill 2004a, p.8)		Decision making rights and accountability, IT strategies and IT investment

Definition	Reference	Type	Context of Perspective
IT Governance is the responsibility of the board of directors and executive management. It is an integral part of Enterprise Governance and consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategies and objectives.	IT Governance Institute (ITGI 2003, p.10)	Practitioner /Body	Governing structure, leadership and process

Table 2. 1: Definitions of IT Governance

The context of perspectives addressed in Table 2.1: Definitions of IT Governance, shows that IT Governance specifies the structures, processes and relational mechanisms necessary for IT decision making. The design of an organizational strategy should reflect the blending of IT strategies and business strategies as stated by Wessels and Loggerenberg (2006).

Similarly, Peterson (2004b) carried out a number of investigations into strategies for Information Technology Governance and labelled a number of 'IT Governance Myths' which have existed for a long time and still persist; such as IT Governance is the responsibility of executives and business managers, IT Governance is concerned with organizing the IT function, IT Governance is in a higher and broader position than IT management and finally, IT Governance focuses on de(centralization). These are important to be explicitly addressed for organizations looking to move forward with their IT Governance practice.

The next sections will illustrate more about IT Governance background, frameworks and components.

2.3. Background of IT Governance

IT Governance is an integral part of Corporate Governance. The term Corporate Governance has been defined by Sohal and Fitzpatrick (2002, p.98) as "a setting in which others can manage their tasks effectively" and that corporate governance is the response to the question

on what must be done to add value to an organization, including activities such as administration, coordination, appraising and planning (Wessels and Loggerenberg, 2006). The term 'corporate governance' has also been defined by Koch (2002) as describing what an organization must do, how it must be done and the structures required to do it. These definitions explicitly state that corporate governance is critical for directing decisions and includes organizational policies, structures and management processes that ensures the organizational vision, values and strategies (Schwarz and Hirschheim, 2003, Ross and Weill, 2004d). This view is supported by Patel (2002), who writes that governance is a multifaceted activity that ensures the proficient and successful use of organizational resources, thus realizing their desired aims. In essence, Koch (2002, p.1) made a profound statement that ' Without good governance, you won't get good decisions consistently'. He argues that there are two main components essential for governance: the decision-making mechanism, to choose the right mechanism that fits the corporate need such as: committees, board and written policies. The other component is assigning decision-making authority and accountability, such as management responsibilities to implement and deliver reports.

IT Governance has been a subject of debate since the late nineties when attention was given to the Corporate Governance as a response to the Enron and WorldCom collapse (Denise and Dieter, 2010). These cases led to the passage of new governance legislation, such as the Sarbanes-Oxley (SOX) Act in the United States in 2002. The SOX Act was created by the United States federal law on July 30, 2002 and initiated by Senator Paul Sarbanes and Representative Michael G. Oxley. All accounting firms listed on the American stock exchange (American or not) are required to comply with the established standards. The Act contained a range of rules, from describing responsibilities of the corporate board to criminal penalties and obligations for corporate wrongdoing. For instance, obligating the Securities and Exchange Commission to implement the necessary accounting standards for compliance. Although the focus of this act was on accounting and financial reporting, it has been noticed that IT systems are the dominant evidence for reporting procedures (Dietrich and Officer, 2004). Consequently, this has coerced organizations into re-examining the overall structure of their IT procedures and management to ensure more accountability (Grant, 2005).

Koch (2002) stated that IT Governance is often more theoretical than practical and reported that most governance mechanisms are created to solve specific problems, such as IT investments, but little thought is given to how they work together. Therefore, the focus of the overall governance has influenced the research in the IT Governance field; hence researchers recognized its vitally and regarded IT Governance as a subset of Corporate Governance (Grembergen, 2004b, Luftman, 2010). Researchers also explored the IT/business alignment and looked into the gaps between IT organizations and the rest of the business (Denise and Dieter, 2010, De Haes, 2009, Peppard, 1999, Luftman, 2003).

IT Governance emerged as a result of its important relationship with information technology, where IT activities have become strongly aligned with those of business (Grembergen, 2004b, ITGI, 2007, Luftman, 2003). Peppard (2001) argues that alignment is important in light of the business continuity and the link of business and IT as this is an expected consequence of the dependency upon IT-based systems and more business being conducted in a computer-mediated environment. Alignment maturity evolves into a relationship where the function of IT and other business functions adapt their strategies together and this fusion between business and IT has gained much academic attention (De Haes, 2009, Peppard, 1999, Luftman, 2000).

Organizational activity requires this strong fusion of business and IT partnership focusing on the process of organizing and managing IT. Peppard (1999) introduced a framework of four interdependent dimensions: leadership, structures and processes, service quality, and value and beliefs. These trends emerged from a survey he conducted on three selected organizations and there he identified a gap between the business and IT departments within the organization. This framework will be illustrated in Chapter Four when presenting the IT Governance Conceptual Model.

Researchers continue to propose that IT Governance should be part of the overall corporate Governance process (Grembergen, 2004b, Luftman, 2010). However, it continues to be a compromise of management processes, procedures and policies established to provide decisions and directions to the IT service, and resources including risks, compliance and performance. Similarly, Wei and Jinlong (2008) proposed that IT Governance should be part of corporate Governance and IT Governance comes from practice. Their study of eleven

companies in China investigated the experience of practitioners and concluded that IT Governance was at an initial stage with a positive vision to a mature stage in the future.

Peterson (2004a) presented a holistic and an architectural view of IT Governance, such that structural, process and relational capabilities exist. He differentiated between the IT Governance model as centralized, decentralized and federated and these can be applied to each of the main elements in the portfolio of IT, such as investments, applications, services and IT components. It was widely acknowledged that these different elements offer distinct patterns in the governance of IT.

Ross and Weill (2004a) stressed the need to gain backing at a senior level to specify decision rights and an accountability framework to encourage the desirable behavior in IT use. They viewed IT Governance structure as the single most important predicator of whether an organization will derive value from IT. It is "a rational set of arrangements and mechanisms" Ross and Weill (2004a, p.183). Therefore, forming committees to provide the formal and effective management over IT is essential; such as an IT strategy committee to review and approve IT strategy and provide high-level direction and control (Denise and Dieter, 2010). Another example is establishing a "steering" committee as highlighted by Grembergen (2004b); this is a senior management control to provide direction and advice to the strategy formulation process.

Campbell et al. (2009) continues the discussion within this field of managing IT and highlighted the contrasts of IT Governance issues in the private and public sector. The authors argued that 'there are systematic differences between private and public sector organizations that impact Governance'. In both sectors, a combination of processes, structures and relational mechanisms can be deployed highlighting similar factors presented in the previous paragraphs. It is worth noting that IT Governance maturity assessment was beyond the scope of that research; nonetheless, a significant conclusion states that "there is a paucity of empirical research on public/private sector IT Governance" as stated by Campbell et al. (2009, p.14); therefore, further studies are needed in this approach and also to include the dimensions of IT Governance and maturity assessment.

There is significant research on how organisations assess IT/Business strategic alignments, but understanding the maturity of an organisation will assist in recommending, improving and sustaining the business/IT relationship (Peterson, 2004a). For this purpose Luftman (2004) presented a strategic alignment maturity model with six related criteria (refer to Figure 2.1: Alignment Maturity Criteria). In this view, we can observe that Governance maturity has been considered as one part of the model. Each criterion is measured on a scale from 1 to 5 (as shown in Figure 2.2: Strategic Alignment Maturity). Luftman's strategic alignment maturity assessments involved five levels of maturity:

1. Initial/Ad Hoc Process (does not fit the organisation, or the organisation is very ineffective)
2. Committed Process (low level of fit for the organisation)
3. Established Focused Process (moderate fit for the organisation, or the organisation is moderately effective)
4. Improved/Managed Process (fit most of the organisation)
5. Optimized Process (strong level of fit through the organisation, or the organisation is very effective)

Each of the five alignment maturities, illustrated above, focuses on a set of six IT-business alignment criteria as presented in Figure 2.1: Alignment Maturity Criteria and these are:

1. Communications Maturity
2. Competency/Value Measurement Maturity
3. Governance Maturity
4. Partnership Maturity
5. Scope & Architecture Maturity
6. Skills Maturity

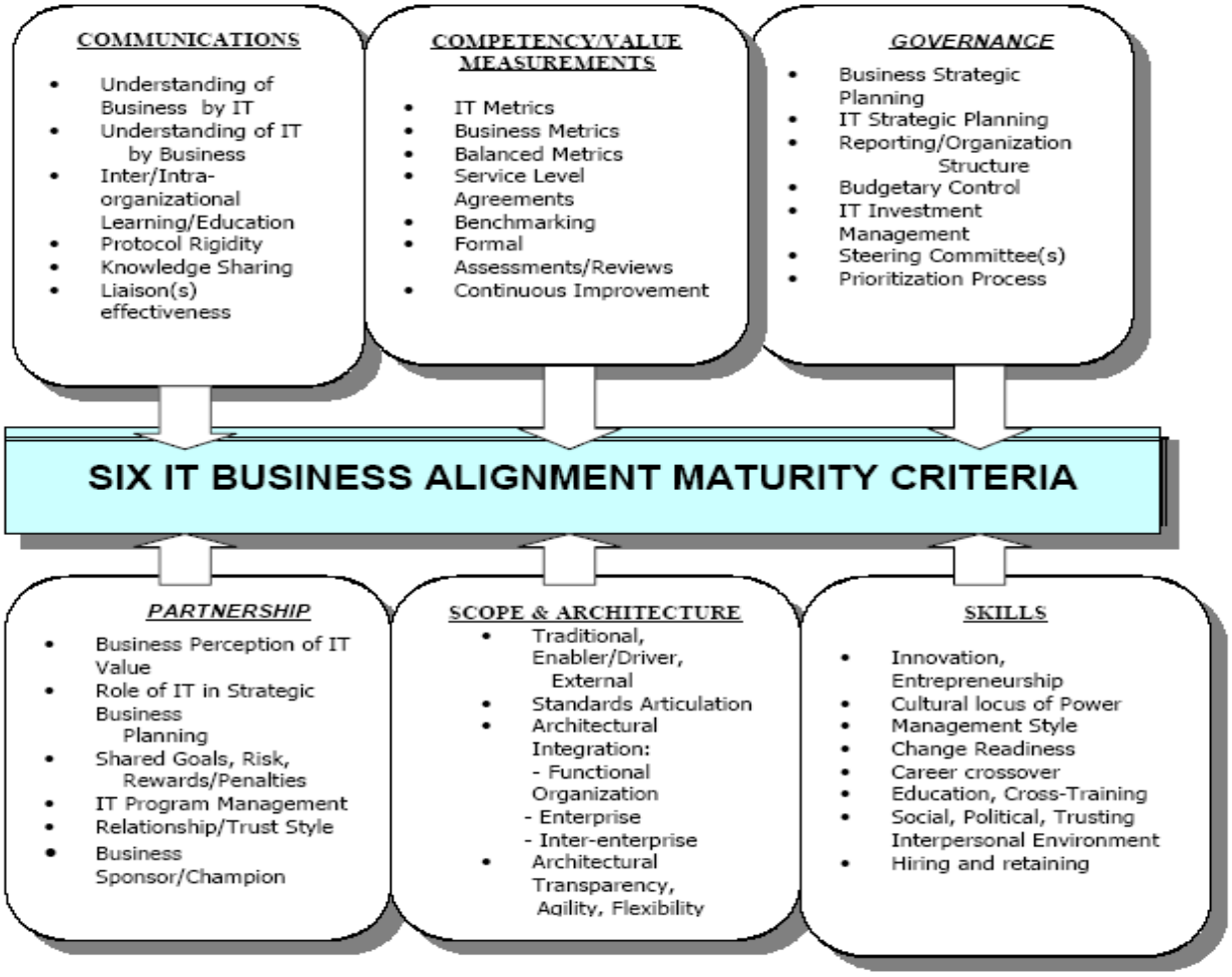


Figure 2. 1: Alignment Maturity Criteria (Luftman, 2000)

Luftman (2004) conducted a specific process as a part of the assessment. He selected a team including both business and IT executives to address the alignment maturity level. The most important part in this process is the creation of recommendations addressing the problems identified to improve the business-IT alignment. In fact, his model studied and found numerous articles showing where a company stands regarding maturity and once this maturity is understood, it can provide the organisation with a roadmap that identifies opportunities for enhancing the harmonious relationship of business and IT (De Haes, 2009, Smaczny, 2001, Fasanghari et al., 2015, Haes and Grembergen, 2008, Chung et al., 2003, Chen, 2010).

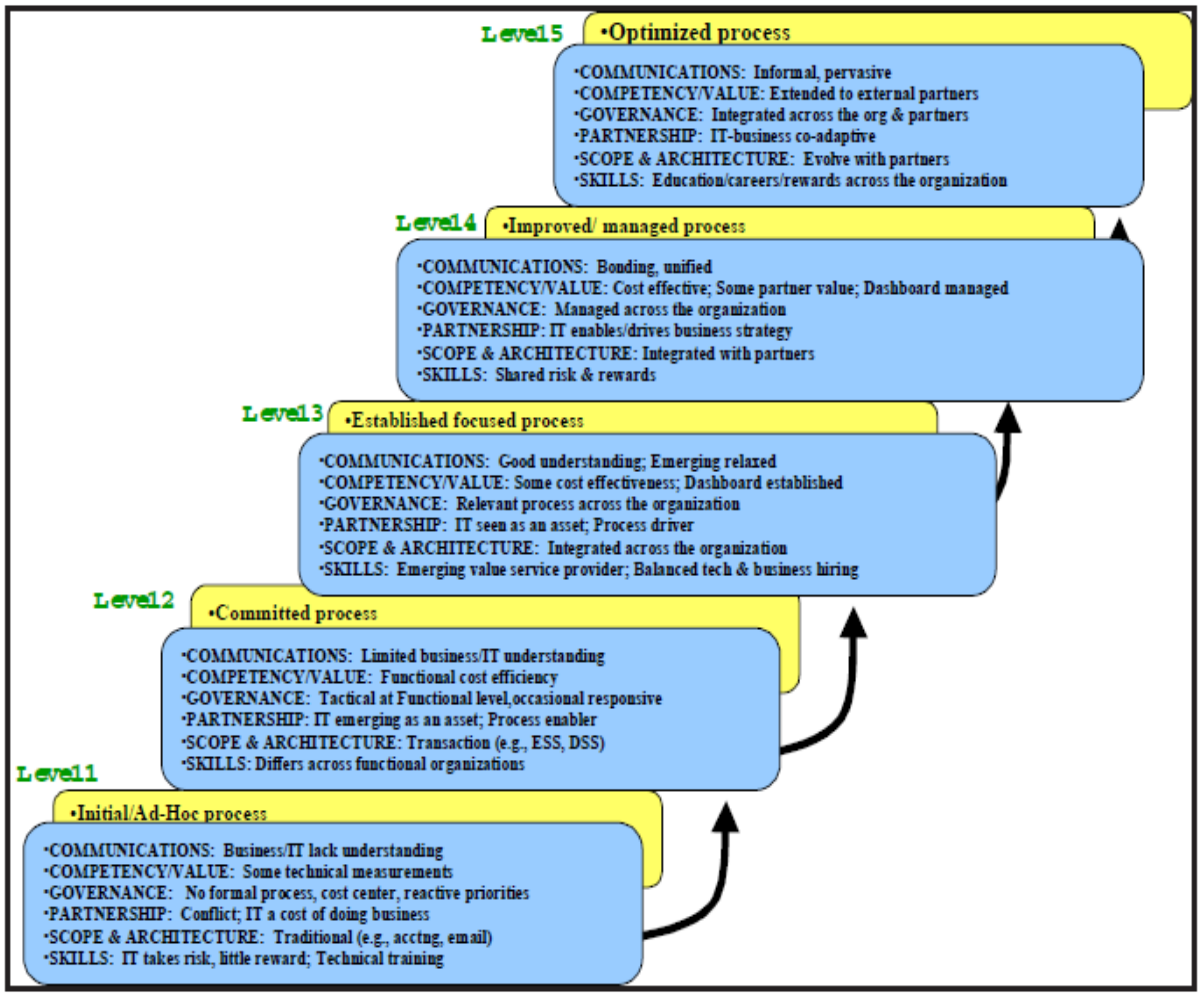


Figure 2. 2: Strategic Alignment Maturity (Luftman, 2000)

Similarly, as part of the aim of this research project, IT strategy and IT-business alignment are fundamental parts for implementing the IT Governance model in the organisation. As Haes and Grembergen (2008) state: "having developed a high-level IT Governance model does not imply that governance is actually working in the organisation". IT Governance is influenced by different factors that are interconnected. Therefore, Haes and Grembergen(2008) argue that conceiving the Governance model is the first step, implementing it into the organisation is the next challenging step.

2.4. Public Sector and Private Sector Organizations

Information Technology (IT) is not only essential to the organisational business; it also becomes an integral part for public sector organisations in order to deliver services for stakeholders. This can be seen from the emergence of online technologies that had significantly impacted the government's capacity to deliver services. Therefore, if the technologies used in the public sector are unreliable or not keeping pace with latest trends in the IT environment, then the organisation will be at risk and will not improve the government capacity to perform (Campbell et al., 2009). The governance structure in place ensures the efficacy of how IT decision-making and accountability processes span, because IT Governance is the structure of relationships, processes and mechanisms used to develop, direct and control the resources allocation to enable the organisation to achieve its goals and objectives. However, there are different characteristics between the 'public' and 'private' sectors and researchers have argued that a "one size fits all approach to IT Governance may not apply" as pointed out by Campbell et al. (2009, p.5) . This argument is consistent with Weill (2004b) interpretation as it overlooks the reason behind the variations in IT Governance patterns resulting from the five factors. For instance, industry and regional differences will create unique pressure on the organisation because decision-making culture varies across different regions in the world. Another significant factor is the size and diversity of the organisation reflects on IT Governance because while the organisation grows both geographically and organisationally, this will introduce competing and even conflicting objectives. The remaining three factors are: strategic and performance goals, organisational structures and the governance experience.

The two common terms frequently appearing are "Private Sector" and "Public Sector". Previous researchers mentioned that the distinction between the two is not straightforward because of the similarity of the roles, context and function of the organisations in both sectors (Campbell et al., 2007, Campbell et al., 2009). However, researchers mentioned that the two terms can be distinguished by the level of government control on ownership, besides the type of service they provide (Campbell et al., 2009).

The private sector is organizations who are largely not government controlled (Campbell et al., 2007, Campbell et al., 2009). This is because of the competitive advantage in IT

investments and innovations for-profit enhancements. In addition, there are non-profit organizations in the private sector which expect a lower level than for-profit organizations because of their dependency on voluntary funding, such as humanitarian committees. In contrast, the public sector is organizations who provide services on behalf of the government and are economically funded by the government. These are often referred to as the 'government' sector. It also includes 'semi-government' organizations because they are self-funded by selling services and working independent of the budgetary allocation from the government, for example, hospitals, registration boards and nursing homes (Campbell et al., 2007).

Researchers have further investigated the differentiated factors between the public and private sectors. Both public and private sector organizations may seem to face resource difficulties, therefore, budgetary constraints are challenging. This can be illustrated from the number of projects rejected because of the risk involved; however, IT managers have the arduous task of providing IT value (Campbell et al., 2009). The public sector has multiple and conflicting goals with numerous programs and stakeholders which have competing interests. In general, the government prioritises these goals along with the policy direction scope, whereas the private sector is guided by the market signal and profit. Consequently, the primary objective of private sector organizations is the financial profitability besides the efficiency and quality of their services, while the public sector organizations are judged more on the achievements of their policy mission and political efficiency. Thus, researchers mentioned that political influence and structural change factors mainly relate to the public sector which can destabilize the governance mechanisms. The political cycles may cause disruption in the top level management. Therefore, project prioritizing will be significantly affected by the new administration. This may also yield data discontinuity and thereby weaken the governance monitoring (Bozeman and Bretschneider, 1986).

The focus of this research is to investigate IT Governance Practice in the public sector. The next section will illustrate the differences between IT Governance and IT Management.

2.5. IT Governance and IT Management

There does not seem too much difference in the meaning of the words Governance and Management because they both share the relationship with “to direct” and “to act”. A study conducted by Sohal and Fitzpatrick (2002) indicated that many organisations fail to realise the full capability of their IT and IS system; as a result they fail in leveraging their IT potential for strategic benefit due to poor IT management and/or governance. Researchers consider IT Governance versus IT management and often regard them as synonymous (Figure2.3: Governance versus Management). This can be due to lack of literature that differentiates between the two concepts. IT management is often identified as the “focus on internal effective operation of IT products and services”, or “the administration of existing IT operations”. In contrast, IT Governance is considered to be much broader and “focuses on transforming IT to meet the present and future demands and goals”; this is for both the business and customers.

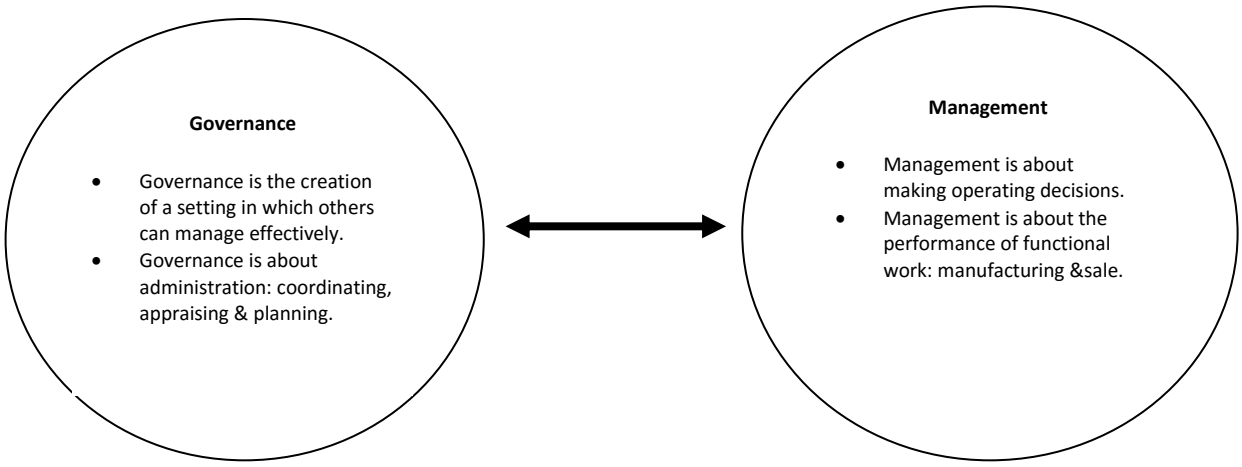


Figure 2. 3: Governance versus Management (Sohal and Fitzpatrick, 2002)

Similarly, Campbell et al.(2009, p.8) propose that IT Governance is “a high level activity aimed at ensuring that IT is aligned with the present and future demands and goals”. In this way, IT Governance is defined as an enabler for the creation of an environment in supporting others to perform their tasks effectively (Sohal and Fitzpatrick, 2002). Furthermore, it has been suggested that IT management is concerned with mostly one question “what decisions

are made?", whereas IT Governance is concerned with two questions. The first is "who should make decisions?" and the second is "how will these decisions be monitored?" (Sethibe, 2007, Campbell et al., 2009, Sohal and Fitzpatrick, 2002). The main differences are illustrated in Table 2.2: Governance & Management in an IT context.

Governance	Management
External and internal focus	Internal focus
Present and Future	Present
Strategic (corporate level & business)	Decisions at Operations and Projects
Delegation	Hands-on
Whole-of-organization	Unit/Department & individuals
Wise investment	Budget accountability
Benefit realization	Cost & Quality

Table 2. 2: Governance & Management in an IT context (John, 2009)

In fact, governance mainly focuses on oversight, accountability and strategic decisions, while management focuses on strategic decisions, management decisions and controls, and operational management. Therefore, there is an intersection between the two terms in the area of strategic decisions because, as mentioned in Section 2.3, the term IT Governance is part of the concept "Corporate Governance" and IT Management is part of the "Corporate Governance". This relationship between IT Governance, Corporate Governance and IT Management has been debated by researchers, who agree that IT Governance is only one part of Corporate Governance and should not be implemented separately (Ridley et al., 2004). It was also demonstrated in previous studies that if business management is not committed to IT management, misinterpretations and inconsistency are to be expected (Wessels and Loggerenberg, 2006, Ribbers et al., 2002). This argument relies too heavily

on IT Governance's aim to align business and IT, and consequently this point supports the suggestion that IT management is only one aspect of IT Governance. For instance, assume a typical organisation has corporate governance, indicating that IT Governance and IT management are present. The corporate governance is a combination of various sub-components aligned in order to ensure that the organisation moves in the direction towards a defined goal. Wessels and Loggerenberg (2006) also confirm that IT Governance is designed to group the IT function of different business units and to centrally discipline it. Therefore, the coverage area for IT Governance is in the upper-middle including the Directors level and up (Top management in the organisation), while the coverage for IT Management is in the middle- lower and includes the Director and down.

To conclude, IT Governance is specific for the organization and is the responsibility of the top management to give direction and control over IT, while IT management services can be assigned to an external provider (such as outsourcing) and have an internal focus at the unit/department level. Hence, one common statement noted from the different research papers explains that a change to an organization's strategy may well require changes to the management but not to the governance of an asset (Ross and Weill, 2004a, Campbell et al., 2009, Sethibe, 2007).

2.6. IT Governance Frameworks

During the past two decades, internal and external pressures have motivated legislators, accountants and managers to continue efforts in developing and refining internal control concepts. This attention was part of a response to the new governance requirements and the increased emphasis placed on internal controls in organizations (Ridley et al., 2004). These controls are the activities undertaken either to eliminate risks or reduce them to a level that is considered acceptable (Hollander et al., 1999). Therefore, different IT Governance frameworks and methods have emerged. Some are developed into a set of guidelines, whereas others are considered best practice. Figure 2.4: IT Governance Frameworks and Standards usage; illustrates the variance in IT Governance frameworks, standards and methods usage adopted from the ITGI study (ITGI, 2011).

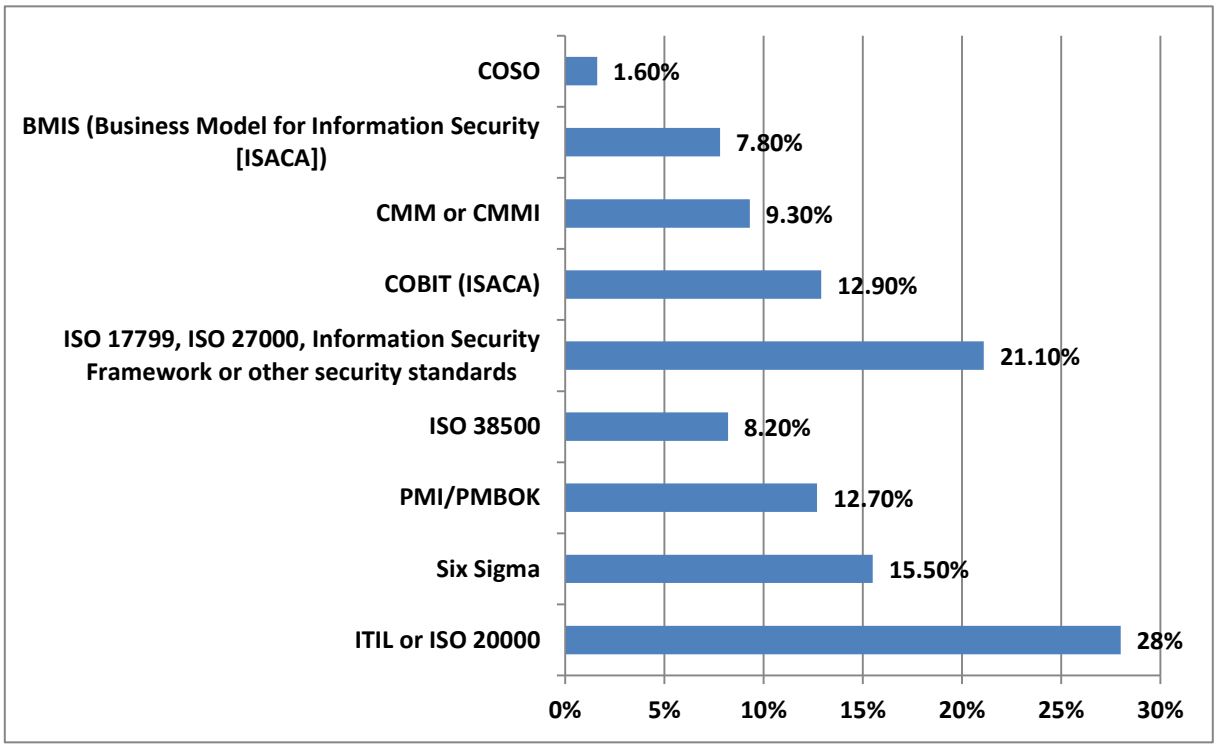


Figure 2. 4: IT Governance Frameworks and Standards usage. Sources available in (ITGI, 2011).

Figure 2.4: IT Governance Frameworks and Standards usage, shows that ITIL is the most used framework with 28%, whereas COSO was the least frequently preferred framework. Throughout this rigorous literature review process, some of the frequently cited frameworks and methods are explained through the next paragraphs, such as: COSO, BMIS, CMM, COBIT, ISO 27000 series, PMBOK, ITIL and Six Sigma. These are further summarized in Table 2.3: A summary of IT Governance Frameworks and Methods.

2.6.1. ITIL

The information Technology Infrastructure Library (ITIL) is a framework introduced in 1980 and designed by the British Office for Government Commerce (OGC) to enable effective management of IT in the British authorities and other public companies to support implementation of processes related to delivery and support

(Kneller, 2010). ITIL is considered the most adopted guidance for IT Service Management in all business organisational environments. ITIL adopts a 'lifecycle' approach to IT services and has been classified into five stages. These are summarized as follows:

- Service strategy: To develop an IT service strategy as collaboration between the business strategy and IT service provider.
- Service design: To meet customers' business objectives by being both 'fit-for-purpose' and 'fit-for-use'.
- Service transition: To manage and control the live IT operational environment and transition of new or changed IT services.
- Service operation: Forecasting the business benefits by proper delivery and support strategy.
- Continual service improvement: To ensure continual improvements of IT services by adopting a process of learning from experience.

Therefore, ITIL provides useful disciplines needed in the field of service management and service delivery; however, it has been argued that it does not cover the strategic impact of IT and the relation between IT and business (Simonsson and Ekstedt, 2006).

2.6.2. COBIT

Control Objectives for Information and related Technology (COBIT) is an IT Governance framework with supporting toolset created by the Information System Audit and Control Association (ISACA) in 1996. ISACA was incorporated in 1969 by a small group of individuals who recognized the increased need for control within IT organizations and a centralized source of information and guidance. Today, ISACA is a global organization and serves 140,000 professionals in 180 countries (Kessinger et al., 2015). In 1998 ISACA established the Information Technology Governance Institute (ITGI) and in 2007 version 4.1 of COBIT was released; this represents the reference framework in this thesis.

Later, COBIT 5.0 was released in 2012 and was recognized as a basis to integrate other frameworks, standards and practices in one single framework (Ampe et al., 2012). For instance, COBIT is connected to major frameworks and standards, such as Information Technology Infrastructure Library (ITIL), The Open Group Architecture Forum (TOGAF), Project Management Body of Knowledge (PMBOK), Projects IN Controlled Environments 2 (PRINCE2), Committee of Sponsoring Organizations of the Treadway Commission (COSO) and the International Organization for Standardization (ISO) standards. Moreover, COBIT 5.0 has integrated all major ISACA frameworks and guidance, such as COBIT, Val IT, Risk IT, and Business Model for Information Security (BMIS) and the IT Assurance Framework (ITAF). A justification on the adoption of COBIT 4.1 and the main differences with COBIT 5 are illustrated in the next sections (Section 2.9).

COBIT has captured ideas from all the frameworks above and provides a detailed model to govern IT. COBIT is divided into four domains which are classified in turn into 34 IT processes and each with related maturity levels (ITGI, 2007). These four domains are: Planning and organizing (PO), Acquisition and implementation (AI), Delivery and support (DS), Monitoring and evaluation (ME). The four domains are clarified below:

1. ***Planning and organizing (PO):*** Includes the strategy and tactics used by IT to achieve business objectives, strategy planning, strategy communication, strategy management, risk management, and resource management, which ensures that the required technology infrastructure and human capital are in place.

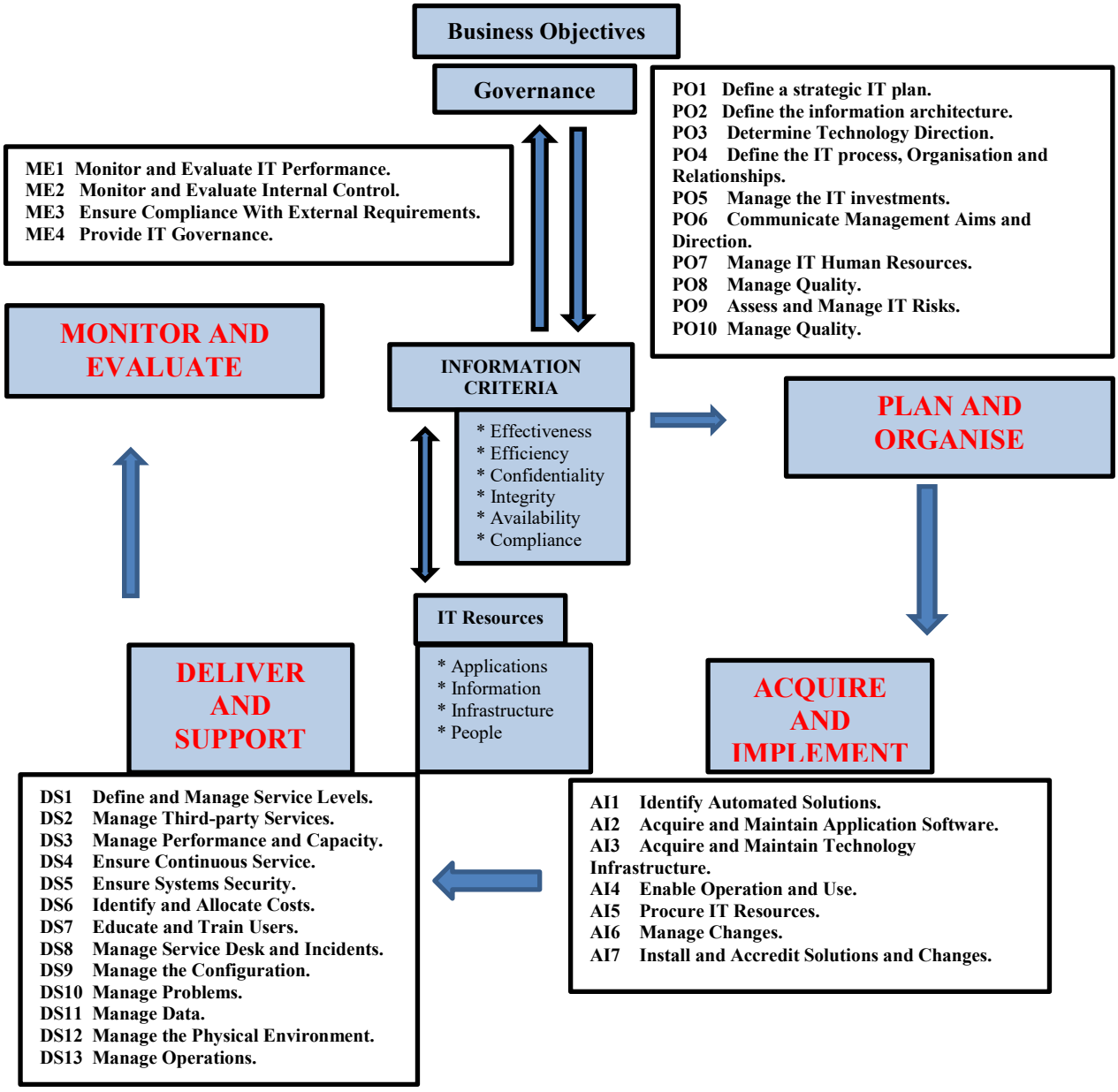


Figure 2. 5: COBIT 4.1 Processes

2. ***Acquisition and implementation (AI):*** To realize the IT strategy, IT solutions must be identified, developed or acquired, as well as implemented and integrated into the business process. Additionally, it must manage the life cycle of existing systems through maintenance, enhancements, and retirements.
3. ***Delivery and support (DS):*** IT delivers services to its customers (users). This domain concerns service and support issues including performance and security, and it also includes training.
4. ***Monitoring and evaluation (ME):*** All IT processes need to be regularly assessed for their quality and compliance with control requirements. The monitoring domain addresses the management's oversight of the organization's control processes.

Further, the four domains in turn are divided into 34 processes as shown in Figure 2.5: COBIT 4.1 Processes, illustrating the names of all COBIT processes. Each process encompasses detailed control objectives and provides a complete set of high-level requirements to be considered by management for effective control of each IT process. According to ITGI (2007, p.13), "control is defined as procedures, practices and organisational structures designed to provide reasonable assurance that business objectives will be achieved and undesired events will be prevented or detected and corrected". Moreover, COBIT provides an incremental measurement scale of six maturity levels in each process. These maturity levels will be illustrated in Section 2.8 in the justification for the adoption of COBIT 4.1 in this research.

2.6.3. ISO 27002

The Department of Trade and Industry (DTI), which is part of the UK Government, published a 'Code of Practice for Information Security Management' in 1993. After two years, the document was amended and republished as BS 7799:1995 and another

as BS 7799:1998 by the British Standards Institute. Some major enhancements were published again in 1999 as BS 7799:1999 ((BSI), 2013).

The International Organization for Standardization (ISO) established a joint technical committee with the International Electrotechnical Commission (IEC) and published the ISO/IEC standards series (Heschl, 2011). The essential parts of the ISO/IEC standards were based on the BS 7799 published in 1995 by the British Standard Institute. The first track to become as ISO standard was in 2000 and became known as ISO/IEC 17799:2000 ((BSI), 2013).The original British Standard was issued in two parts and the term ISO/IEC 27002 is often used as a generic term to describe them (Hardy and Heschl, 2008). The original BS includes:

- BS 7799-1: Information Technology- Code of Practice for Information Security Management. This part was revised in 1998 and then published by ISO as ISO/IEC 17799 in 2000 in its first edition. Then, this was finally incorporated into ISO/IEC 27002 in 2007.

- BS 7799-2: Information Security Management Systems- Specification for Guidance for use. This part was first published in 1999 and then adopted by ISO as ISO/IEC 27001 in November 2005.

The goal of implementing this standard is to provide information security within the organization. It is classified as best practice for developing and maintaining security standards and management practices to improve reliability in the interorganisatuional relationships. The standard adopts a process approach 'Plan-Do-Check-Act' (PDCA) and stresses the importance of risk management by defining a number of security control strategies with a clarification that it is important to implement only the relevant guidelines.

2.6.4. PMBOK

The Project Management Body of Knowledge (PMBOK) is a collection of Global Standards and best practices for Project Management. The PMBOK guide is structured into nine knowledge areas with 42 processes ((PMI), 2011). The knowledge areas include:

- Project Integration Management: This is the process of reviewing the change requests across the entire project and requires coordinating. Therefore, integrated change control is not limited to processes and paperwork, rather includes tracking systems and approval levels for authorizing changes, such as: Change Control Board (CCB) and Technical Review Board (TRB).

- Project Scope Management: The concept is determining the exact scope of the project and making sure to complete all the work within the allocated time and cost. This can be identified by collecting requirements from project stakeholders to achieve the objective.

- Project Time Management: This knowledge area contains all the processes that identify and control activities, sequence activities, estimate durations and resources, such as identifying a specific schedule activity need in order to be performed to produce project deliverables.

- Project Cost Management: This area includes the processes involved in estimating, budgeting and controlling costs so that the project can be completed within the approved budget.

- Project Quality Management: This is a continuous improvement of the overall quality road map for the organization to ensure project performance. This concept is further elaborated into strategic Quality Management (SQM) that requires an organization-wide commitment (Srinidhi, 1998, Maylor, 2001). The role of strategy is supported by an analysis of project failures which indicates that the lack of a clear strategy is a root cause of failure as reported by Maylor (2001) and available in (Buttrick, 2015).

- Project Human Resources Management: The involvement of creation and managing project team members for project planning and decision-making. There are general management skills required, such as; leading, communicating, negotiating, problem solving and influencing. However, the most critical role is the project manager who must find ways to improve competency and interactions between the project team members for accomplishing the work. This knowledge area also involves processes for developing human resource plans, such as: identifying and documenting project roles, responsibilities, required skills and reporting relationships. For this purpose, there are several abilities that the project manager or any manager cannot do without, including interpersonal skills (known as soft skills), such as: empathy, influence, creativity, mentoring, coaching, ability to build trust and leadership skills.

- Project Communications Management: This includes all the processes that deal with project information in a judicious and unambiguous way. The communication type may differ, but remains as essential part in project management because project managers spend about 90% of the time communicating with project teams, customers, sponsors and other stakeholders as mentioned in Project Management Body of Knowledge Workbook ((PMI), 2011).

- Project Risk Management: According to the PMBOK Guide ((PMI), 2011, p.320), risk is defined as: "An uncertain event or condition that if occurs, has a positive or negative effect on a project's objectives". This knowledge area involves the identification, prioritization, and measurement of risks that may affect the existing project and finds the most appropriate response by monitoring the effectiveness of the entire exercise. This ideal practice of risk management is proactive rather than reactive. Therefore, planning the process of how to conduct risk management and deciding the activities for the project drastically increases the possibility of the project's success ((PMI), 2011). There are different tools and techniques that can be used to identify risks, such

as: Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis, checklist analysis and documentation reviews.

- Project Procurement Management: This involves all the processes required to effectively and economically initiate, document, select and manage all activities that are outsourced (Sub-contracting). The most significant part in this knowledge area remains in understanding the proper contract types and legal judgment approvals.

The goal of implementing this framework is the centralized management of one or more portfolios, which is "a collection of projects or programs and other work that are grouped together to facilitate the effective management of that work to meet business objectives" ((PMI), 2011, p.31). The portfolio management includes identifying, prioritizing, authorizing, managing and controlling for the aim of achieving specific strategic business objectives.

2.6.5. CMMI

The Software Engineering Capability Maturity Model (SE-CMM) was created by the Software Engineering Institute (SEI) of Carnegie Melon University and then developed into the Capability Maturity Model Integration (CMMI) in 2000 (Simonsson et al., 2010, Mallette, 2011). The CMMI consists of best practices and focuses on improving processes in an organisation across a project, a division or an entire organisation; by providing an effective evolutionary path from ad hoc, immature processes to disciplined, mature processes. Therefore, this model enables benchmarking an organisation to increase productivity and quality. However, it has been reported that these techniques do not allow a clear understanding of capability across the complete range of activities (Debreceny and Gray, 2009).

Typically when CMMI has been used, the information delivered to the organisation has failed or has rarely addressed certain criteria, such as: security requirements like confidentiality, integrity and availability. These terms are further illustrated in Section 2.7 and Section 2.8. CMMI also did not address the compliance with laws or

regulations, or the reliability in provision of the appropriate information for management. The IT resources addressed by CMMI are Applications, moderately addressing People and Infrastructure but not directly addressing Information.

Framework/method	Brief description
Information Technology Infrastructure Library (ITIL)	This is considered a world-wide best practice standard for service management. The focus of ITIL is on critical business process and disciplines required for delivering high-quality service.
Control Objective for Information and Related Technology (COBIT)	COBIT is a process model divided into 34 processes in version 4.1. It provides policies and good practice for IT security and control in organizations with clear responsibilities to plan and monitor.
ISO 27002	This is the counterpart of British Standard BS 7799 and covers controls and best practices for information security and covers ten categories; security policy, security organization, asset classification and control, personal security, physical and environmental security, communication and operations management, access control, system development and maintenance, business continuity management and compliance.
Project Management Body of Knowledge (PMBOK)	The processes are considered best practice to manage any project including IT projects.
CMMI	The Software Engineering Institute created the Capability Maturity Model (CMM) and more recently Capability Maturity Model Integration (CMMI). This model enables organizations to measure their existing capabilities and mainly focuses on improving performance.

Framework/method	Brief description
Six Sigma	This is a problem solving approach or process based approach for managing projects including IT. In IT, Six Sigma can be used for performance improvements in network speed and reliability of systems.
The Committee of Sponsoring Organizations of the Treadway Commission (COSO)	The focus is on operational, compliance and financial control for both management and auditors when dealing with risk and internal controls.
The Business Model for Information Security (BMIS)	The model developed by ISACA consists of four elements (organization, technology, process, and people) and six dynamic interconnections (culture, human factors, governing, architecture, enabling and support, emergence).

Table 2. 3: A summary of IT Governance Frameworks and Methods

2.6.6. Six Sigma

The Six Sigma is a method that was created by Motorola Inc. in the USA in 1987 (Hekmatpanah et al., 2008). During this time, there was a competing threat from Japan in the electronic industry. Motorola built Six Sigma upon methods and principles of Deming's Total Quality Management to make drastic improvements to quality levels. (Linderman et al., 2003, p.195) proposed and defined Six Sigma as:

> "An organized and systematic method for strategic process improvement and new product and service development that relies on statistical methods and the scientific method to make dramatic reduction in customer defined defect rates"

The concept is further related to a goal of less than 3.4 defects per million opportunities (DPMO) for every process. Therefore, Six Sigma is a business initiative or process to drastically improve and monitor the organization's everyday business activities in a way that reduces defects, waste and resources, and consequently increases customer satisfaction (Schroeder et al., 2008).

2.6.7. COSO

The Committee for Sponsoring Organizations of the Treadway commission (COSO) was organized in 1985 and in 1992 it developed the Internal Control recommendations to management on how to evaluate reports and improve control systems (COSO, 2015). COSO is recognized as a private sector organization and is dedicated to improving the quality of financial reporting through business ethics and effective internal controls. The Internal Control system consists of five interrelated components: control environment, risk assessment, control activities, information and communication and monitoring. The control environment is considered the base for the other components.

COSO provides guidance on how to evaluate these factors, such as: management philosophy and operating style, human resources policies, ethical values of employees and organizational structures. The risk assessment consists of risk identification: to examine the external factors like technological development and economical change, and internal factors like personal quality and the characteristics of information system processing. The risk analysis consists of the estimates of significance of risk, and assessing the likelihood of accruing and how to manage this risk. Control activities are related to policies and procedures to ensure employees comply with management direction and include: review of physical controls, segregation of duties and information system controls. Information is the key asset that management relies on for decision making and they communicate it through the organization. The information system identifies, operates and reports information useful for the control organization activities. The organization personnel receive and understand the roles and responsibilities and report problems to higher levels of management. Finally, the

management monitors the control system by reviewing the output generated and conducting evaluations.

2.6.8. The Business Model for Information Security (BMIS)

The Information Systems Audit and Control Association (ISACA) developed the BMIS. The model consists of four elements and six dynamic interconnections. BMIS can be used to predict how a change in the elements (organisation, technology, process, and people) is impacted by culture, human factors, governing and the other dynamic interconnections.

The BMIS uses the concept of "system thinking", which is viewed holistically. A holistic approach examines the system as a complete functioning unit and one part of the system enables understanding of other parts of the system (ISACA, 2009).

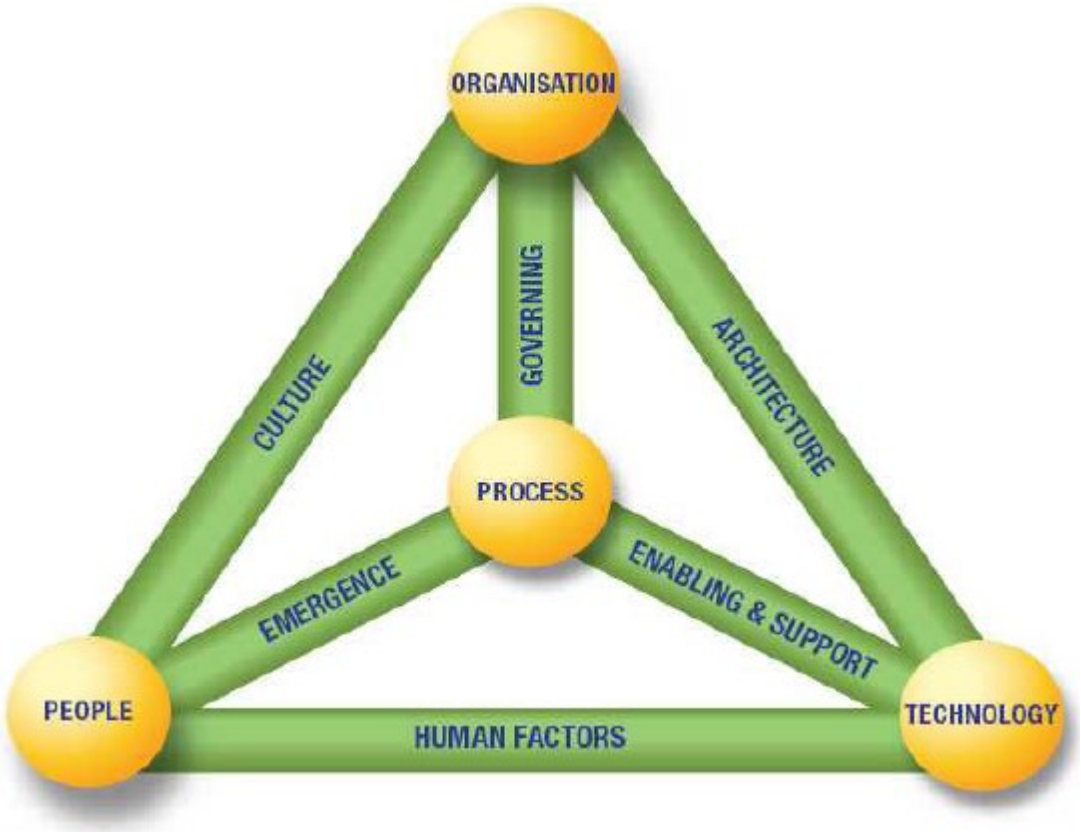


Figure 2. 6: The BMIS, available from (ISACA, 2010)

BMIS is primarily a three-dimensional model. It consists of four elements and six dynamic interconnections (Dis). The model is shown as a pyramid in Figure 2.6: The BMIS, but it can be turned or distorted depending on the point of view of the observer. As a rule, all parts of BMIS interact with each other. Elements are linked to each other via the Dis. If any one part of the model is changed, other parts will change as well. In a comprehensive and well-managed information security universe, the model is seen to be in balance. If parts of the model are changed, or if security weaknesses persist, the balance of the model is distorted. The interdependencies amongst parts of BMIS are a result of the overall systemic approach. The model addresses the three traditional elements considered in IT (People, Process and Technology) and adds a critical fourth element (Organisation). In terms of the information security programme, the flexibility and influence of elements and Dis vary. Some elements are comparatively inactive, but ever-present, such as the overall shape and design of the enterprise. It is there, but it should be seen as a boundary for the security management initiatives rather than an active and ongoing influence. Likewise, people are an important element, but not one that changes over time. Human nature will persist, and it is only through cultural change that behaviours will adapt to what the security programme intends to achieve. To obtain the maximum value from this model, it is important to understand that this Dis may be affected directly or indirectly by changes imposed on any of the other components within the model, not just the two elements at either end. The focus of this research is on IT Governance practice and maturity level; however BMIS assists enterprises to understand the issues of information security management at any given time and is able to help with designing solutions quickly and effectively. Moreover, the governing concept defined in BMIS in addition to other dynamic interactions and elements are supported by the COBIT framework. The BMIS is out of this research scope.

To summarize, organizations adopt different approaches to governance either on an ad hoc basis and form their own framework or alternatively, they implement one or a combination of the developed frameworks; they benefit from best practices, perfected through the experience of other organizations. However, organizational settings, the number of business units and the relationship among them remain fundamental steps to implementing any governance method. COBIT for instance relates to core IT processes in the

organization providing maturity models for each of the processes. Further, COBIT is considered a generic IT framework that can be used for private and public sectors and applied to different organizational sizes and industry branches. Several studies have used the COBIT framework to investigate the IT environments in diverse entities from private and public sectors with their own unique characteristics and business processes (Lapão, 2011, Lin et al., 2010, Nugroho, 2014, Ayat et al., 2011). Therefore, the COBIT framework has been selected as our research tool for investigating IT Governance in practice that considers lessons learned from previous efforts in using the same framework in practice (Pederiva, 2003, Guldentops et al., 2002).

2.7. IT Governance Focus Areas

IT Governance describes five areas (or domains) that should be regular items on the agenda. These focus areas are defined as: IT strategic alignment, value delivery, risk management, resource management and performance management, as illustrated in Figure 2.7: Scope of IT Governance practices. The first two are outcomes and the next three are drivers. IT Governance is concerned with two: the value of IT delivery to an organisation and the control and mitigation of IT- related risks (ITGI, 2007, ITGI, 2003). The first concern can be driven by strategic alignment between IT and business, and the second is driven by embedding accountability into the organisation. The five IT governance focus areas are further illustrated in the next sub-sections.

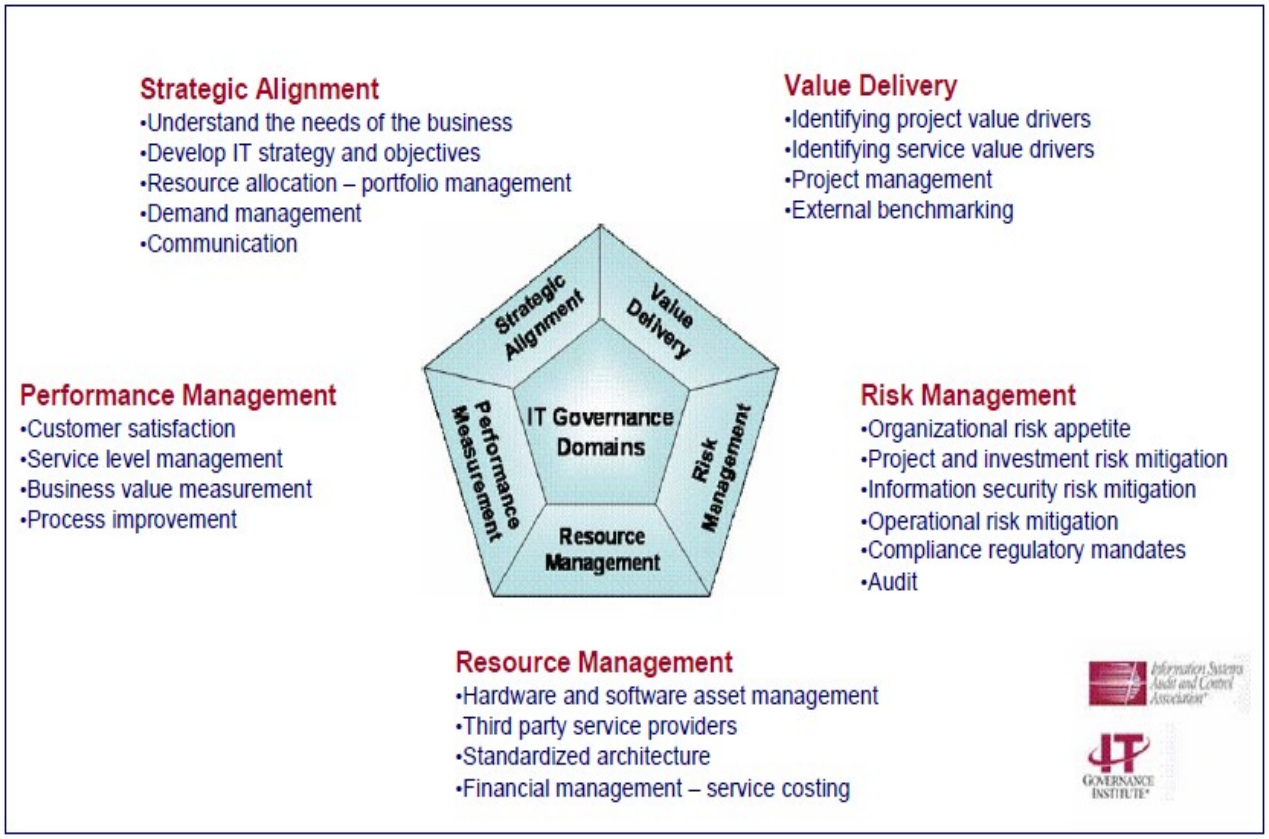


Figure 2. 7: Scope of IT Governance practices, available in (Milne and Bowles, 2009)

2.7.1. IT Strategic alignment

Alignment is an arrangement or position in a straight line or in parallel lines. Aligning IT strategy with business strategy has been one of the top three issues confronting IT and business executives for more than 20 years. Given this focus and attention over the years, most enterprises should have attained good IT and business alignment, but recent polls of CIOs and business executives reveal that aligning IT and business goals remains a top priority.

Alignment of IT strategy and business strategy is the result of strong IT governance structures and processes that have matured to the point of being part of an organization's

culture. More importantly, strategy alignment must be monitored and measured, and management must be held accountable for the results.

Both information technology (IT) and business leaders are continually looking for management practices to help them align their IT and business strategies. Business-IT alignment is a desired state in which a business organization is able to use information technology (IT) effectively to achieve business objectives - typically improving financial performance or marketplace competitiveness. Some definitions focus more on outcomes (the ability of IT to produce business value) than means (the harmony between IT and business decision-makers within the organizations).

Alignment seems to grow in importance as companies strive to link technology and business in light of dynamic business strategies and continuously evolving technologies (Jerry, 1996). This importance aside, what is not clear is how to achieve and sustain this harmony relating to business and IT, how to assess the maturity of alignment, and what the impact of misalignment might be on the firm (Hosseinbeig et al., 2011). The ability to achieve and sustain this synergistic relationship is anything but easy. Identifying an organization's alignment maturity provides an excellent vehicle for understanding and improving the business-IT relationship.

There are five types of alignment that might exist in any organization; the first is the Business alignment of aligning organizational resources and organizational strategy. It was built upon the idea that an organization's structure and resources should evolve to support the strategic mission of the organization. Researchers argued that organizations should have a long-term coordinated strategy rather than allowing the individual functions within the organization to operate independently (Baker and Jones, 2008). Strategy is defined as the creation of long-term goals, the selection of courses of action that would enable the achievement of the goals, and the subsequent allocation and deployment of resources to achieve the goals.

The second type is IT alignment, which is the alignment between IT resources and IT strategy. The logic behind this type of alignment is that when IT strategy is developed and then IT resource deployment is guided by that IT strategy, the organization is well-

positioned to execute its IT strategy. The successful execution of an appropriate IT strategy enables the organization to achieve its goals. Third is the Contextual alignment, where **o**rganizations should strive to align their organizational resources with the competitive context in which the organization exists. The competitive context includes the industry context, the macroeconomic context, and other national and cultural factors. This type of alignment has its roots in the Industrial Organization paradigm that explains that organizations develop strategy in response to the structure of the industry in which the organization competes. Next is the structural alignment which describes the congruence between organizational resources and IT resources. Finally, the strategic alignment examines the link between IT strategy and organizational strategy. The business alignment, IT alignment, strategic alignment, and structural alignment are all developed within the boundary of the organization. The remaining type of alignment, contextual alignment, necessitates interaction with forces outside the boundary of the organization. The degree of each of these five types of alignment, as well as the organizational strategy, the organizational resources, the IT strategy and the IT resources, then impact on the organization's performance.

According to ITGI (2007, p.6):

> "strategic alignment focuses on ensuring the linkage of business and IT plans; defining, maintaining and validating the IT value proposition; and aligning IT operations with enterprise operations."

The strategic alignment is to ensure that IT strategy is in harmony with business strategy and is considered part of the five domains for IT Governance. This is driven as a continuous life cycle starting from strategic alignment.

2.7.2. IT Value delivery

IT value delivery is about executing the value proposition throughout the delivery cycle, and making sure that IT delivers the promised benefits against the strategy, concentrating on optimising costs and proving the intrinsic value of IT (ITGI, 2007). IT investment has

been increasing for years as managers look for ways to manage IT successfully and to integrate it into the organization's strategies. IT managers need to consider some pinpoints, such as: be knowledgeable about how the new IT technologies can be integrated into the business as well as among the different technologies and architectures, be privy to senior management's tactical and strategic plans, be present when corporate strategies are discussed, and understand the strengths and weaknesses of the technologies in question and the corporate-wide implications. Therefore, effective value delivery can be achieved only if the actual costs and Return on Investment (ROI) are managed (Hardy, 2006).

2.7.3. Risk Management

Information Technology plays a significant role in the daily functionality of organisations among different sectors. Risk is connected with work because risk is an uncertain event or condition ((PMI), 2011). Therefore, the objective of risk management is to protect IT assets, such as: data, hardware, software and facilities from external threats (natural disasters) and internal threats (technical failures or unauthorised access) (Artur, 2009).

According to ITGI (2007, p.6), "risk management is connected with awareness by senior officers to understand the organisation's appetite for risk, understanding of compliance requirements, transparency about the significant risks to the enterprise". Risk management includes identification, prioritization and implementing the effective control. Therefore, the management of the organisation is responsible for implementing proactive approaches for minimizing this risk to an acceptable level or adopting responses, such as: mitigating, avoiding, transferring, exploiting, sharing, enhancing, and accepting or a contingent response. Moreover, in the final part of the definition, the ITGI(2007, p.6) pointed to "embedding of risk management responsibilities into the organisation". Therefore, at the first stage, the organisation determines the potential impact of internal and external threats to this shared environment. Next, the organisation selects the methodologies to comprehend the loss of IT assets, and this is known as the risk analysis process. The methodologies available are categorized as: quantitative

methods (use of applications with numerical measures to estimate risk value), qualitative methods (present a description of results including recommendations and can use scenario analysis or surveys or questionnaires) and a mix of the previous methods (hybrid). Consequently, the evaluation of risk provides an indication the relevant controls that should be adopted. This is the third stage where various measures can be implemented for reducing IT risks. The major types of IT control are: administrative controls, technical controls and physical controls. The administrative control is concerned with approved written policies, procedures, guidelines and standards. Monitoring and control access to information and computing systems can be controlled technically; for example by using passwords, data encryption, firewalls, IDS, intrusion detection systems and access control lists. The physical environment can be controlled and monitored by distinct methods, such as: doors, locks, air conditioning, smoke and fire alarms and security guards.

IT risk management is crucial for the organisation because it can lead to reputational risk, significant costs and disruptions with contractors. This indication requires monitoring to ensure the effectiveness of the adopted measures that should be aligned with legal and regulatory requirements (Artur, 2009).

2.7.4. Resource Management

The IT resource management is about the ideal investment and management of critical resources, such as: people, applications, information and infrastructure (ITGI, 2007). This important domain aims to oversee the adequately and comprehensive funding and use of IT from an organizational level to ensure the availability of these resources. Therefore, decisions related to resource management must be addressed at a high-level. This view is supported by other researchers who point out that IT infrastructure is the foundation of planned IT capability (both technical and human) available as shared and reliable services and used by multiple applications (Weill and Aral, 2004, Weill et al., 2002, Ross and Weill, 2004a).

This foresight in IT infrastructure preserves the right resources and enables future initiatives. Gheorghe (2010) argues that this important domain of IT Governance is related to project management and the practice of IT resource management must be properly governed by considering the strategic direction, identification of the organization needs (priorities) and impact on the financial position.

2.7.5. Performance Management

The ITGI (2007, p.6) states that Performance Management:

> "tracks and monitors strategy implementation, project completion, resource usage, process performance and service delivery, using, for example, balanced scorecards that translate strategy into action to achieve goals measurable beyond Conventional accounting."

Performance Management is tracking the quality of the services that the IT organization is delivering over the use of its resources. Several attempts have been made to increase or explore how to assess the performance of IT Governance due to its complexity extent. Ross and Weill (2004a) demonstrated that the effectiveness of IT Governance performance is in delivering four objectives and these are weighted by their importance to any organization: cost-effective use of IT, effective use of IT assets utilization, effective use of IT for growth and effective use of IT for business flexibility. Frameworks, such as COBIT and Balanced Scorecards, can also be utilized to assess the performance of IT Governance; however, they can be challenging to put into practice (Tu, 2007, Grembergen and De Haes, 2006). For instance, Tu's argument relies on the fact that IT Governance evaluation criteria should be objective, measurable, easily understood and guide orientation. Elsewhere, Debreceny and Gray(2009) have argued that COBIT recognizes that fulfilling the objective of the organization requires development of systematic capabilities. Another argument points out that successful IT Governance has no fixed model (Weill, 2004b) or is directly controllable (Simonsson et al., 2010), but is influenced by different factors that are interconnected (Janahi et al., 2014).

Even though the characteristics of IT Governance differ from one organisation to another due to the available controlling factors, such as organisational structure, size of organisation and stage of development, they need to keep within the same evaluation criteria. On this, Janahi et al. (2014) mentioned that IT Governance is specific to the organization and it is the responsibility of the board and senior executives to give direction and control over IT.

Difficulties arise, however, when an attempt is made to obtain a general understanding of the IT Governance improvements. Researchers have investigated service quality indicators or Key Performance Indicators (KPI), which are quantitative metrics critical for the success of the organization and therefore evaluations are based upon these agreed factors (Clementi and Carvalho, 2006). A further study by Gheorghe (2010) for instance defined a set of relevant documents to be analyzed by an IT auditor as a process before establishing interviews with senior management, selected staff and IT users for assessment. The documents are related to:

- IT strategies and plans to provide evidence of planning and management's control of the IS/IT environment (this part has been illustrated in Section 2.7.1).
- Security policy and procedures documentation.
- Organizational charts to illustrate roles and responsibilities (organizational structures will be illustrated in Section 2.10 in this chapter).
- Job description to define the functions and responsibilities of positions throughout the organization and to identify conflicting duties (this is connected to the organizational chart).
- Steering committee reports to provide information about new system projects (Section 2.11 will discuss the Steering Committee Charter).
- Operations procedures to describe the responsibilities of operation staff.
- System development cycle and program change procedures.

2.8. The adoption of COBIT 4.1 Framework

The Control Objective for Information and Related Technology framework (COBIT) is the most well-known IT Governance maturity assessment as stated in numerous literature (Simonsson, 2008, Simonsson et al., 2010, Clementi and Carvalho, 2006, Debreceny and Gray, 2009, von Solms, 2005, Hardy, 2006, Ribeiro and Gomes, 2009, Tuttle and Vandervelde, 2007). "Control" is adopted from the COSO Report (Internal Control) and "IT Control Objective" is adopted from the SAC Report (Systems Auditability and Control Report) (Guldentops and Grembergen, 2004). COBIT is a framework based on best practice focusing on the processes of the IT organization and how their performance can be assessed and monitored (Simonsson and Johnson, 2006, ITGI, 2007).

COBIT 4.1 is divided into 34 processes and grouped into four domains, as illustrated in Figure 2.5: COBIT 4.1 Processes. COBIT provides distinct potent management guidelines consisting of maturity models, critical success factors (CSFs), key goal indicators (KGIs) and key performance indicators (KPIs). Critical success factors are activities that can be of a strategic, technical, organizational, process or procedural nature to provide the management with guidance for implementing control over IT. A key performance indicator defines the process goal and is a measure of what has to be accomplished, while a key performance indicator is a measure of how well the process is performed. According to Debreceny and Gray (2009), a key concept in COBIT is the determination and systematic enhancement of process maturity. The process maturity is built on the Software Engineering Institute's (SEI's) Capability Maturity Model (CMM), available in Figure 2.8. CMM has six levels to measure the maturity of the IT process; starting from 0 (non-existing), 1-Initial, 2-Repeatable, 3- Defined, 4-Managed and 5-Optimizing. However, COBIT expands the CMM and provides a description for each process within the framework. COBIT subdivides the process maturity into six attributes added in an increasing manner through the levels; they are:

- Awareness and communication, policies.
- Polices, plans and procedures.
- Tools and automation.

- Skills and expertise.
- Responsibility and accountability.
- Goal setting and measurement.

This classification provides a straightforward and logical movement from one discrete level to the next higher maturity level. The adoption of the framework enables management with assessing capabilities to define their current position with regard to the international standards and where it wants to be. Yet, some researchers have argued that CMM in COBIT is challenging or the method requires an experienced analyst to perform the assessment due to the knowledge requirement about the framework and apply it as a tool to support IT Governance (Simonsson et al., 2007). Other researchers adopted COBIT and found improvement in the quality of services and controls (Ribeiro and Gomes, 2009). Similarly, researchers have endeavored to integrate frameworks into a comprehensive framework and found that COBIT is capable of providing an integrated platform (Lin et al., 2010, Sahibudin et al., 2008).

Further, in this research an investigation into other frameworks and standards was performed as mentioned in the preceding paragraphs (Section 2.6). The comparison between COBIT and the rest of the selected ones indicate that the existing frameworks vary depending on the focus such as financial or to control procurement and development or to control the alignment between IT and business. For example, COBIT controls IT and considers resources and processes including a detailed guide for IT, while COSO pinpoints five control components for achieving the objective of financial reporting. Another example is the ITIL which provides useful practice in the field of service management and delivery, however it does not cover the strategic impact of IT and the relation between IT and business (Sallé, 2004). Guldentops and Grembergen (2004, p.279) concluded that COBIT combines the principles embedded in existing and known reference models; for example: quality requirements (quality, cost, delivery), fiduciary requirements (effectiveness and efficiency of operations; reliability of information; compliance with laws and regulations) and security requirements (confidentiality; integrity; availability). Therefore, the COBIT Framework, regardless of the version, defines and explains a

methodology for controlling and assessing the effectiveness, efficiency, integrity, reliability, availability, compliance, and confidentiality of IT resources.

0 Non-existent– Complete lack of any recognizable process. The enterprise has not even recognized that there is an issue to be addressed.

1 Initial/ad hoc– There is evidence that the enterprise has recognized that the issues exist and need to be addressed. There are, however, no standardized processes; instead there are ad hoc approaches that tend to be applied on an individual or case-by-case basis. The overall approach of managing is disorganized.

2 Repeatable but Intuitive– Processes have developed to the stage where similar procedures are followed by different people undertaking the same task. There is no formal training or communication of standard procedures, and responsibility is left to the individual. There is a high degree of reliance on the knowledge of the individuals and, therefore, errors are likely.

3 Defined Process– Procedures have been standardized and documented, and communicated through training. It is mandated that these processes should be followed; however, it is unlikely that deviations will be detected. The procedures themselves are not sophisticated but are the formalization of existing practices.

4 Managed and Measurable– Management monitors and measures compliance with procedures and takes action where processes appear not to be working effectively. Processes are under constant improvement and provide good practice. Automation and tools are used in a limited or fragmented way.

5 Optimized– Processes have been refined to a level of good practice, based on the results of continuous improvement and maturity modelling with other enterprises. IT is used in an integral way to automate the workflow, providing tools to improve quality and effectiveness, making the enterprise quick to adopt.

Figure 2. 8: Generic definition of COBIT 4.1 maturity model (ITGI, 2007)

Roles and responsibilities within COBIT are suggested to include: Chief Executive Officer (CEO), Chief Information Officer (CIO), Business Executives, Chief Finance Officer (CFO), Head Operations, Chief Architect, Head Development, Head IT Administration, The Project Manager Officer (PMO) and Compliance audit risk and security. For every process, COBIT defines a number of activities for the responsible employees organized in a chart, called RACI-chart (Responsible, Accountable, Consulted and Informed). However, these roles are found to be not completely compatible with IT Directors in public sector organizations covered in this study. Therefore, the researcher discussed with the IT Director the idea of mapping and fitting the processes within the roles and responsibilities available in the selected public practices.

In fact, COBIT Management Guidelines do not suggest any methodology to measure the maturity level of the IT process; this research adopted COBIT 4.1 and required some

adjustment to provide us with the quantitative measures, and this method has been informed from previous research in this domain (Pederiva, 2003).

2.9. Justification for the difference between COBIT 4.1 and COBIT 5

As already explained, COBIT provides corresponding high level control objectives and management guidelines together with their maturity models in the form of scales from 0(non-existing) to 5(optimized). From the start of this research process in 2011, COBIT 4.1 was the framework selected as the research tool; however, there have been never versions released since that research decision was made. In this term, there was a critical need to review COBIT 5 and justify the framework selection. Additional findings from this study were presented at a conference opportunity in United Arab Emirates organized by the British Computing Society (BCS) (Janahi et al., 2014) and then another conference organised by the Information Systems Audit and Control Association (ISACA)(ISACA, 2012). This included a networking opportunity with professionals and sessions with practitioners in the related subject where advice was gained on using the COBIT framework for this study. It was decided that the framework should be adopted drawing on feedback from the practitioners at the ISACA and BCS conferences.

Considerable improvements have been made to the COBIT framework to position it as a model for corporate governance of Information Technology. Unlike its predecessor (COBIT 4.1) and ITILv3, the COBIT 5 framework addresses all three levels of an IT governance framework. Both COBIT 4.1 and ITIL v3 are process models that describe IT practices at the operational level providing a useful source of good practices. However neither COBIT 4.1 nor ITIL v3 address the management practices necessary to marshal and use IT resources effectively and efficiently nor does COBIT 4.1 or ITIL v3 describe the corporate governance processes essential for directing and controlling the use of IT.

The improvements to COBIT 5 include restructuring the description of the individual processes, identifying the actual base practices within each process and describing the key

activities within each base practice. A summary of differences between COBIT 4.1 and COBIT 5 follows:

Processes in COBIT 4.1 that are merged in COBIT 5

- DS7 is merged with PO7 (Education and Human Resources)
- PO6 is merged with PO1 (Management Communications and Management)
- PO2 is merged with PO3 (Information and Technical Architectures)
- AI2 is merged with AI3 (Application Software and Infrastructure Components)
- DS12 is merged with DS5 (Physical Environment and Information Security)

Processes in COBIT 4.1 that are reassigned in COBIT 5

- ME4 to EDM1, 2, 3, 4, 5 (Governance)

Processes in COBIT 4.1 that are relocated in COBIT 5

- PO1 to APO2 (Strategic Planning)
- PO4 to APO1 (Organisation, Relationships and Processes)

Entirely new processes in COBIT 5

- EDM1 Set and Maintain Governance Framework
- APO1 Define the Management Framework
- APO4 Manage Innovation (partly PO3)
- APO8 Manage Relationships
- BAI8 Knowledge Management
- DSS2 Manage Assets (partly DS9)
- DSS8 Manage Business Process Controls.

The most significant change to COBIT is the reorganization of the framework from being an IT process model into an IT Governance framework with a set of governance practices for IT, a management system for the continuous improvement of IT activities and a process model with baseline practices. The process capability maturity models and assessments approach is based on ISO/IEC 15504 process assessment model and the COBIT Assessment Programme. Therefore, the COBIT 4.1 maturity modelling approach was terminated and considered not to be compatible with ISO/IEC 15504 because the methods use different attributes and measurement scales. However, moving to the new COBIT assessment approach will require: realigning the previous rating, adopting and learning the new method and initiating the set of assessment practices. COBIT 5 guidance can be used, but must use the COBIT 4.1 generic attribute table without the high-level maturity models (Chapter, 2014).

The focus of this study was on selected IT processes and adopted assessment processes including the maturity model which uses a scale derived from SEI\CMM. The assessment process included a number of stages; planning, data collection, process rating, validation and reporting. These will be discussed in detail in the next chapters (Chapter Three-Research Methodology). Therefore, the research questions and objectives, justified earlier in Sections 1.4 and 1.5, are met within the use of COBIT 4.1. However, with the developed web-based assessment, Excel sheets, tables and algorithms used for calculations can be amended and extended to fit with COBIT 5 processes as a future work plan for this study. Additionally, the research focused on a selective process, thus the amendments will be based on that selection or could be extended to capture a wider range of processes.

2.10.Information System (IS) Organizational Structure

Organisational structure affects the behaviour of the firms through at least two channels. First, structure can have an effect on companywide measures of performance, such as profitability or speed in adopting productivity enhancing innovations. Second the structure of the firm can have consequences for the individuals or operating units that comprise the organisation (DeCanio et al., 2000). Organisational structure can be represented using network models (i.e., networks of social relations). The structure of the IT function and the position of the decision-making authority in an organisation to a large part determines the efficacy of IT governance (Ross and Weill, 2004a). For instance, a study based on a Belgian financial services organisation (private sector) found that the organisation had the Chief of Information Officer CIO reporting directly to a member of the executive committee, having an IT strategy committee that operates at the strategy level besides an IT/business steering committee that decided on new investments (De Haes and Grembergen, 2005). Another case study introduced by (Ross and Weill, 2004a) was on London's Metropolitan Police Service; the executive body is the Management Board and directly supervises various strategic committees, including Information Management Steering Group. This committee makes recommendations for IT investments and suggests to the Management Board how to start and fund projects, whose proposals are supervised by designated business sponsors right up to completion (Campbell et al., 2007). Therefore,

it is common to use a steering committee as a popular way of monitoring and reporting progress in all sectors (Sohal and Fitzpatrick, 2002).

A research study by (Denise and Dieter, 2010) states that structure can be viewed as how the IT function is carried out; for instance through dedicated responsibilities to an IT executive and relevant IT committee (De Haes and Grembergen, 2005). Moreover, a decision must be made to locate where the IT decision-making authority is located within the organisation (Grembergen, 2004b). (Ross and Weill, 2004a) approached IT governance structure as the single most important predictor of whether an organisation will derive value from it. They viewed structure as "a rational set of arrangements and mechanisms" (Ross and Weill, 2004a, p.183). Moreover, they introduced structure as consisting of organisational units, roles, and responsibilities for making IT decisions between management and IT committees. There are three primary modes of IT decisions made around IT: centralized, decentralized and the federal mode (Webb, 2006). The adoption of a centralized mode indicates the authority to make all IT related decisions, whilst the decentralized mode can take on a number of configurations and involves divisional IS and line managers. The federal mode finds IT related decision making distributed between the organisations, divisional IS and line management.

2.11. Steering Committees

IT Governance is cited as a strategic issue that requires commitment at the strategic level (Mohamed and Singh, 2012, Turel and Bart, 2014, De Haes, 2009). Therefore, IT Governance can be said to mainly relate to IT decision-making authority and the capability of the organization to practice this process. According to Huang et al.(2010) and Sambamurthy and Zmud (1999) argued that effective governance must carefully balance the pent-up pressure toward centralization and decentralization that invariably plays out within organizations. Therefore, IT Governance in practice requires how structural arrangements and interpersonal relationships operate in balancing the organization with local unit tensions that pervade IT-related decision making and actions (Schwarz and Hirschheim, 2003).

IT steering committees are recognised and advocated as effective governance mechanisms for aligning IT-related decisions and actions (Huang et al., 2010). McKeen and Guimaraes (1985) pointed to atypical definitions for the steering committee as a formal body that meets on a regular basis to address specific IT-related issues and members interact during these deliberations to ensure that represented interests and perspectives are heard. For example, the Project Steering Committee will monitor and review the project status, as well as provide oversight of the project's deliverable rollout. The Steering Committee provides a stabilizing influence to organizational concepts and directions are established and maintained with a visionary view. Without a steering committee, Weill and Ross (2005, p.26) stated that "individual managers are left to resolve isolated issues as they arise, and those individual actions can often be at odds with each other".

The Steering Committee provides insight on long-term strategies in support of legislative mandates. Members of the Steering Committee ensure business objectives are being adequately addressed and the project remains under control. In practice, typical responsibilities are carried out by performing the following functions:

- Monitoring and review of the project at regular Steering Committee meetings.
- Providing assistance to the project when required.
- Controlling project scope as emergent issues force changes to be considered, ensuring that scope aligns with the agreed business requirements of project sponsor and key stakeholder groups.
- Resolving project conflicts and disputes, reconciling differences of opinion and approach.
- Formal acceptance of project deliverables.

To conclude, IT steering committees function to direct, coordinate and provide oversight to the IT-related activity domain and require providing the members (executives, managers and professionals) with differing vested interests and perspectives.

2.12.The importance of accountability in practice

It has been widely acknowledged that Information Technology is increasingly being used for supporting various aspects in the organisation. The consequences of this usage depend on the way a technology is implemented because it contains opportunities and risks. A key aspect is to gain knowledge of these opportunities and risks. Therefore, the implementation and use of this technology are influenced by the way organisations anticipate accountability (Meijer, 2007, Meijer, 2001). Researchers in the field of theory of governance and accountability found that many commentators have consistently criticised governance centers for lacking accountability (Carrington et al., 2008). Researchers studying accountability discovered that it can mean many different things to many different people. The concept of "account-ability" includes an implication of potentially an "ability" to "account" (Mulgan, 2000). "Accountability" is used as a replacement for many loosely defined political desiderata, such as good governance, transparency, equity, democracy, efficiency, responsiveness, responsibility and integrity as pointed out by Bovens (2010). One sense is associated with the process of being called "to account" to the same authority for one's actions (Mulgan, 2000). Six general elements of accountability processes are defined and considered with the first conceptualization of this term being introduced by (Day and Klein, 1987). These are:

- Trigger: There is an event that triggers the accountability process. This may be a government organisation charging an employee for inadequate action or service. Alternatively, a process of political accountability triggered by press coverage or disaster.
- Accountable person: Someone is accountable or held accountable for what has happened.
- Situation: There is an action or situation for which the person or organisation is accountable.
- Forum: There is an accountable forum to which a person or an organisation is accountable. This is the higher authority for one's action in society at large or within one's organisational position (organisational or legal).

- Criteria: accountability processes require that criteria are applied to judge an action or situation. This is derived from the law or legislation.
- Sanctions: In some cases sanctions may be imposed on the person or organisation. These are in different forms such as: dismissed from work, impose fines or take another decision.

This conceptualization of accountability provides an understanding of three different phases of the term: the information phase, the discussion phase and the sanction phase (Gilman, 1999). The first phase is important for the organisation because the forum gathers data from various sources to reconstruct what has happened. Next, actions are discussed and judged according to certain norms and criteria. In the final phase, sanctions can be applied. Accountability, or specifically, being accountable is considered a positive quality in organisations and most studies only focus on normative issues (assessment of behaviour) as mentioned in the work of Bovens (2010).

Then the research investigated how the scope of the term "accountability" has been approached to identify the important views and their relation with IT Governance in practice. One of most interesting studies on IT Governance research described IT Governance as emerging as the antidote to anemic IT performance (Robinson, 2005). IT Governance is considered a vehicle for bolstering performance by creating a control environment over technology complexity and business challenges. Another research study found that the adoption of IT Governance is believed to improve organisational accountability, thereby resulting in return on investments (Wessels and Loggerenberg, 2006). This results from aligning business and information technology strategies effectively and efficiently. Luftman Jerry (1996, p.200) states that "The art of business process design lies in knowing the correct balance between accountability and procedure that is appropriate for a given process" and continues that "In general, the amount of accountability that should be designed into a given process increases with the amount of adaptability required". Weil and Ross have defined IT Governance as "specifying the decision rights and accountability framework to encourage desirable behavior in using IT" (Ross and Weill, 2004a, p.8). Further, in an attempt to define IT Governance as in (Webb, 2006) the authors suggested a structural level framework for corporate governance in

respect to (Barrett, 2001). The structural level framework should include: Strategic direction, Policies and procedures, Control and accountability systems, Performance management and finally Risk management. In addition, Robinson (2005) found two facets for effective IT Governance: first is some form of entrustment framework that encourages and improves responsibility by assigning decision rights and accountability. The second facet is adopting a framework that provides the rules and controls. This view leans towards the organisation's IT strategy, control mechanisms and decision making structures.

In (Willson and Pollard, 2009, Jaafar and Jordan, 2011) the authors point out that accountability and control is one of the six facets of IT Governance that is commonly associated with corporate governance or strategic information system planning (SISP) in organizations. Similarly, Mulgan (2000) mentioned another extension of accountability in its application to various methods of imposing control over public organisations and found that accountability is sometimes more than a mechanism of control. Recall that IT governance encompasses dimensions (Bowen et al., 2007, Denise and Dieter, 2010, ITGI, 2007). Accordingly, accountability is driven into the organisation by embedding into the IT governance process, i.e., establishing the policies and procedures used to implement the IT investment projects. In this view, "accountability" was argued to be part of "responsibility" and referred to as the "inner responsibility" or "role responsibility" of the individual (Mulgan, 2000). Yet, there is an increasing amount of literature that suggests that inconsistent and unrealized benefits of IT Governance are often more theoretical than practical (Wessels and Loggerenberg, 2006).

Previous research in this domain pointed out that IT Governance should not be approached in a haphazard manner because it is related to decisions and who is making these decisions (Robinson, 2005). Therefore, this research adopted a COBIT framework for investigating and assessing the maturity of IT Governance practice in the selected five public organisations (justifications of this selection were mentioned in the previous section). The maturity model in the COBIT framework is built in a manner that increases the following attributes through its levels:

- Awareness and communication
- Policies, plans and procedures

- Tools and automation
- Skills and expertise
- Responsibility and accountability
- Goal setting and measurement

Hence, the importance of process ownership, roles, responsibly and accountability is embedded into the COBIT framework. As mentioned in the earlier sections, IT Governance covers five main areas: strategic alignment, value delivery, risk management, resource management (people, money, information, applications and infrastructure) and performance measurement. The most important area that influences all others is the strategic alignment. It focuses on integration of strategies of business and IT by defining, sustaining and controlling a proposition of value that IT delivers to the business. It is also responsible for aligning the IT operations to the operations of the company. Nevertheless, researchers in this domain point out that accountability is still a cause of frustration for managers and generates confusion (Willson and Pollard, 2009, Keyes-Pearce, 2002).

This research argues that the locus of accountability is not only the behaviour, but extends to the way organisational arrangements operate. Aprevious study by Bovens (2010) distinguished between the two concepts of accountability, the virtue and as a mechanism, could help to solve at least some of the conceptual confusion and therefore may provide some foundation for comparative analysis (further justification available in Chapter Seven, Section 7.1: Introduction). In the former case, accountability is used as a set of standards for the behaviour of actors in a forum to positively qualify the performance of an actor. In the latter case, accountability is the relation between the actor and the forum, in which the actor has obligations to explain and justify his conduct, whereas the forum poses questions and passes judgment and therefore the actor faces penalties (Bovens, 2010). Both concepts are important because accountability as a virtue provides legitimacy to the public organisation. In addition, accountability as a mechanism is in fact instrumental in achieving accountable and legitimacy of public governance. For example, it is important to collectively identify and address injustice and obligations in order to put things right (ratifications and this type is known as passive accountability). These types of accountability are anticipated to integrate within IT Governance practice.

2.13.Conclusion

This chapter reviewed the normative literature to identify research issues in IT Governance. Comparatively little literature has been shown in the adoption of IT Governance frameworks in the public sector. The research identified a gap in literature, dealing with integrating theoretical models of IT Governance into practice and identified the dimensions of the IT Governance model. Therefore, this chapter established a background for the context of IT Governance that reduces the confusion surrounding the adoption of IT Governance in the public sector and hence supports the researcher in developing the conceptual model for this research (illustrated in Chapter Four). The researcher clarified the difference between the terms public and private sector and the terms governance and management. Then the researcher viewed the different frameworks and standards available to enable justification of the research selection framework. The research used COBIT 4.1 framework to understand and assess the IT Governance practice and justified the difference by comparing it with the latest release of COBIT 5. The chapter also viewed the IT Governance focus areas to identify the main boundaries of the concept and therefore to enable a focus on the barriers to successful adoption of IT Governance in practice. This also requires understanding the impact of IT organisation structures. The structure of the IT function and the position of the decision-making authority in an organisation to a large extent determines the efficacy of IT governance. Therefore, IT Governance in practice requires structural arrangements and interpersonal relationships to operate in balancing the organization with its local unit. This requires a mechanism to advocate by adopting and forming steering committees for directing, coordinating and providing the oversight to the IT-related activity domain.

This research seeks to address the importance of accountability in IT Governance practice and has found that the link between IT Governance and accountability is obvious. Accountability is identified as an essential element to achieving good governance (Halachmi et al., 2011).

Chapter 3
Research Methodology

This chapter describes the research design followed to investigate IT Governance Practice in the Public Sector. In order to collect research data from the case study fields successfully, first the literature review has influenced the researcher's learning process and used the knowledge gained to develop the conceptual model. The methodological approach provides an understanding of what constitutes human knowledge, what kind of knowledge will be attained from the research and what characteristics this knowledge will have. Therefore, these issues rely on the epistemology informing the theoretical perspective and the type of methodology governing the choice of methods. The researcher explains the practical or empirical research design that represents the roadmap followed in this research. At the end of this chapter, the researcher illustrates validity procedures adopted through the different stages of this research study.

3.1. Introduction

This research explores the perspectives and comprehension of different participants within the subject context that is 'IT Governance' and recognizes that each may have experienced a different understanding of the same situation. To illustrate, this research explores IT Governance Practice from multiple perspectives and experiences of multiple employees in different job roles from public sector organisations. This discipline of IT Governance should be studied in a natural setting or "lived reality", hence, this generates the relevant theory from understanding the IT Governance practice and facilitates the development of the conceptual model (SHIP-ITG Model as illustrated in Chapter Four). Moreover, research of IT Governance in the public sectors in the Kingdom of Bahrain is not well known; therefore the research conducted in this study is an exploratory one and aims to investigate the maturity level of each organisation. The research findings from this exploratory study of examining IT Governance Practice will feed into the work of the National Information Communication Technology (ICT) Governance Committee as well as the electronic Government (eGovernment) Authority in Bahrain which represent an important role and are responsible for coordinating and executing initiatives in line with the strategies, plans, and programs set by the Supreme Council for Information Communication Technology (SCICT).

The research design is a logical sequence or plan to guide the researcher to answer the defined questions and objectives; therefore, this chapter presents the way in which the aims, objectives, and research questions of this research study affect the selection of an appropriate research strategy and approach. The chapter is divided into three main sections: the research philosophy is presented in section 3.2 where ontology, epistemology and theoretical perspectives are mentioned. Then section 3.3 points to the research process and design. This section is further divided into subsections and contains the justification of the research strategy adopted throughout this research study. Finally, section 3.4 focuses upon research validity and reliability.

3.2. Research Philosophy

Through the next sections, the researcher will redefine the research project to assess the nature, challenges it confronts including the empirical methods employed and how it is conform to the selected philosophical principle. As a starting point for all research, the next section will introduce the term 'ontology'.

3.2.1. Ontology

An important stage in any dissertation is the selection process of the most appropriate research approach for your particular study. This study is situated in the IS multi-disciplinary field, such as technology, engineering, natural sciences, psychology, sociology, linguistics and management (Galliers, 1992, Richardson and Robinson, 2007). Therefore, there is not a standard structure that covers all domains of IS knowledge. For instance, Galliers (1992) proposes a classification for providing guidance in selecting information system research approaches. The classification suggests that by selecting the object of one's research (society, group or individual) or the purpose of the research (theory testing, theory building or theory extension) one can get a feeling for which research approach would be most suitable. It is clear that this classification is grounded in an interpretative perspective. Similarly, Myers(1997) states that selections are based on some underlying characteristics about what constitutes 'valid' research and which research methods are appropriate; whereas Crotty (1998) is interested in exploring relationships among the myriad ways of how we think about our research. Crotty (1998) uses four basic elements for any research process that researchers need to know. These elements (epistemology, theoretical perspective, methodology and methods) provide a structure to understand the research process and these terminologies are illustrated in Figure 3.1: four elements of the research process. According to Crotty (1998) the hierarchical nature of the structure determines that the assumptions embedded in the primary element inform each subsequent element (Feast and Melles, 2010). Grix (2002) pointed to the 'building blocks' of generic social research, such as ontology (what is out there to know) and epistemology (what and how we can know about it) and considered these as the basic language and central to all social research.

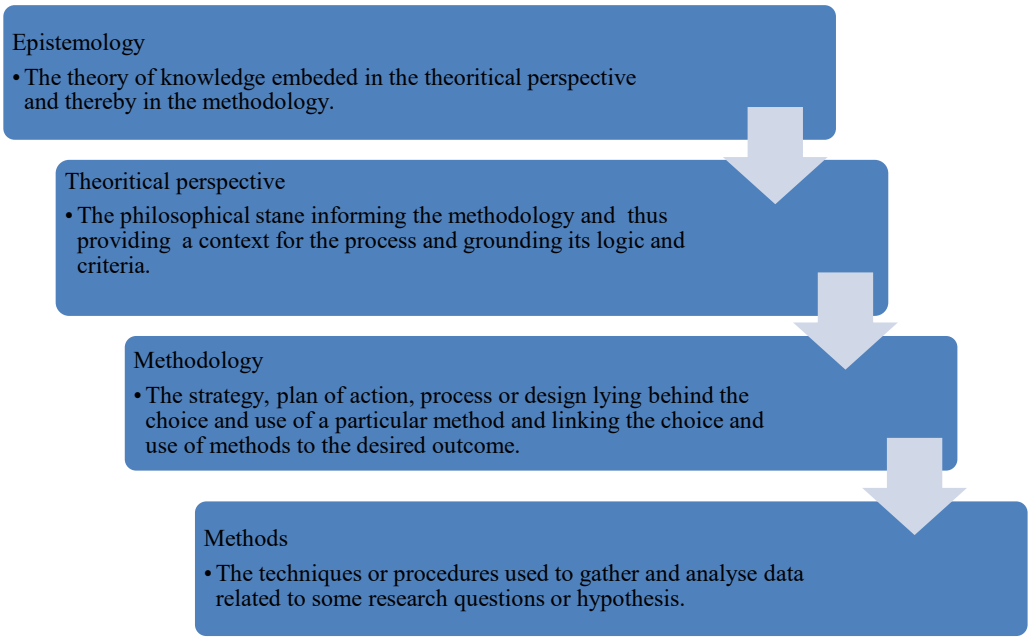


Figure 3. 1: Four elements of the research process adopted from Crotty (1998)

Authors frequently mention the term 'Ontology' in research literature. Ontology is the starting point of all research (Grix, 2010, Grix, 2002, Guarino, 1995, Brewster and O'Hara, 2007, Green and Rosemann, 2005). The ontological issues (reality) and the epistemological issues (knowledge) tend to merge due to the knowledge sharing initiative (Blaikie, 1991, Crotty, 1998, Mary and Patrick, 2004, Becker and Niehaves, 2007, Guarino, 1995). Orlikowski and Baroudi (1991) mentioned that ontology deals with the essence of the phenomena under investigation: whether the empirical world is assumed to be objective and hence independent of humans, or subjective and hence having existence only through the action of humans in creating and recreating it. On the other hand, (Grix, 2002) also declared that examples of ontological positions are those contained within the perspectives 'objectivism' and 'constructivism'. According to (Becker and Niehaves, 2007), the former is illustrated if the researcher assumes a real world one that exists independently of thought and speech processes. It assumes that researchers following this view in the correct way may discover objective truth as pointed out by (Crotty, 1998) and this position is known as 'ontological realism' or 'objectivism' and based on the object-subject paradigm (Mary and Patrick, 2004, Jonassen, 1991). The latter is the case if the

researcher believes that the abstract (theoretical) has some sort of reality independent of the real world such that reality as a construct is dependent on human consciousness. This view assumes meaning is constructed rather than discovered and this position is known as 'ontological idealism' or 'constructivism' (Becker and Niehaves, 2007, Jonassen, 1991).

From another view, authors have examined four paradigms when conducting research in the IS domain and specifically when developing systems to capture assumptions of information systems development on both simple and philosophical grounds. This is mentioned in the article "Four Paradigms of information System Development" introduced by (Hirschheim and Klein, 1989). In this article, the authors defined a "paradigm" as a fundamental set of assumptions adopted by a professional community in which members share the same perspectives and engage in the same practices. This paradigm consists of assumptions about how to acquire knowledge and about the physical and social world. The paradigm is illustrated as follows:

- Functionalism (objective order) is concerned with providing explanations of the status quo, social order, social integration, consensus, need satisfaction and rational choice. It seeks to explain how the individual elements of a social system interact as part of a whole.
- Social relativism (subjective order) seeks explanation within the realm of individual consciousness, subjectivity and within the frame of reference to the social actor as the observer of action.
- Radical structuralism (objective conflict) emphasizes the need to transcend the limitations placed on existing social and organisational arrangements. The focus is mainly on the structure and analysis of the economic relationships.
- Neohumanism (subjective conflict) seeks radical change, emancipation and stress on the role that different social and organisational forces play in understanding change. The focus is to find ways to overcome forms of barriers to emancipation, ideology power, psychological compulsions and social constraints.

Therefore, it is important to understand, acknowledge and defend one's own ontological position. Accordingly, this research is situated within the constructivist ontological position for the following reasons:

- Constructivism is the premise that different people construct meaning in different ways, even in relation to the same phenomena, that is, this research is investigating IT Governance practice in the public sector and in a specific geographical location located in the Kingdom of Bahrain; such thinking grounded in this perception enables the mind to produce mental models that explain to the knower what has been perceived.
- Constructivism enables views and comprehension of different participants within the subject context that is 'IT Governance' to be explored and recognizes that each may have experienced a different understanding of the same situation; this research explores IT Governance Practice from different experiences by approaching multiple cases in the public sector, and IT directors from each case study have different experiences with the group of processes assigned to be evaluated within their practices.

3.2.2. Epistemology

As mentioned in the previous paragraphs, there is a relationship between the ontological approach of a research process and the flow of the epistemological, theoretical perspective, methodology and methods as described in Figure 3.1: Four elements of the research process. The term 'Epistemology' is derived from the Greek words episteme (knowledge) and logos (reason) as stated by (Grix, 2002). Epistemology is the philosophical stance concerning the study of the nature of knowledge, especially to its methods, validation and the possible ways of gaining knowledge of the social reality; therefore, it answers the question of what kind of knowledge is possible and legitimate (Feast and Melles, 2010). According to Orlikowski and Baroudi (1991), three contrasting epistemological positions are commonly used in the literature; positivist studies, interpretive studies and critical studies. Positivist studies are based on the existence of prior fixed relationships within phenomena which are typically investigated with

structured instrumentation in such a way to increase the predictive understanding of the phenomena and to test theory (Orlikowski and Baroudi, 1991). The second term 'interpretive studies' assumes that people create and associate their own subjective meanings as they interact with the world around them in such a way to understand the phenomena through accessing the meanings that participants assign to them (Orlikowski and Baroudi, 1991). Lastly, critical studies aim to critique the status through the exposure of what are believed to be inherent, structural contradictions within social systems (Orlikowski and Baroudi, 1991). For the purpose of this research, Positivist and Interpretive philosophical stances are considered and illustrated in Table 3.1: IS Epistemology Stances.

Previous studies stated that within the empirical approach to IS research, there are two research directions that should be addressed for selecting the proper research strategy: Positivistic and Interpretivist (Ebrahim, 2005). Ebrahim (2005) justified the selection of the interpretivist epistemology stance due to the need to empirically understand the organisations' adoption of e-government in a natural setting. He also added that the interpretivist approach is selected because the unit of analysis is a complex social structure context that is managed and controlled by different people's sense-making. The research cannot be positivist because there are no hypothesis testing or quantifiable measures of variables or formal propositions.

Furthermore, Orlikowski and Baroudi (1991) believe in three IS research paradigms: positivist, interpretivist and critical. They suggest that the positivist was the most widely used in IS articles published between 1983 and 1988. Since then, there has been growing interest in a range of non-positivist or interpretivist approaches due to the increasing realization of the importance of social issues relating to computer-based information systems; for this reason the use of interpretivist studies in IS research has gradually gained weight. Yet, critical research is considered more difficult to define than positivism or interpretivism and the development of research taking the critical approach of IS has been recognized on a very small scale in top publications between 1991 and 2001 as stated by (Richardson and Robinson, 2007), compared to no critical publications in the period investigated by Orlikowski and Baroudi (1991). The critical school definition states that:

> "Critical studies aim to critique the status quo, through the exposure of what are believed to be deep-seated, structural contradictions within social systems, and thereby to transform these alienating and restrictive social conditions." (Richardson and Robinson, 2007, p,225)

According to Irani (1999), there are certain characteristics of the two distinct philosophical views. Those agreeing with the positivist view believe that knowledge may be learned or communicated, and those who agree with the interpretivist believe that knowledge can only be gained through observation and personal experience. Both views have an impact on conducting an empirical research strategy, as the positivists state that the researcher takes the role of an observer, whilst the interpretivists state that the researcher gains knowledge by participating in the subject of the empirical study.

Thus, the research is having characteristics of interpretivist and positivist philosophies. This approach has been selected on the following grounds:

- Interpretivism will allow for studying empirically and understanding in a holistic manner the organisation's processes related to IT Governance practice through close investigation and observations. The natural research setting creates an opportunity for direct observations, such as developing validation instruments, meetings and field visits.

- The units of analysis are five public sector organisations, which are complex social structure contexts and controlled by different decision making processes and structures. Consequently, the interpretivist approach is useful to understand IT Governance in practice.

- IT Governance in each organisation has its own characteristics in the selected framework and therefore given a maturity value. This dependency confirms that the positivist approach is also a suitable approach because it assumes that knowledge consists of facts that are independent and distinct.

- As mentioned in Table 3.1: IS Epistemology Stances; the evidence for IS research to be positivist is if there is hypothesis testing, formal propositions, and these are

not used in the research. However, quantifiable data are needed to measure the maturity level for each organization because IT Governance in the public sector in the Kingdom of Bahrain is not well known. Therefore, the research is exploratory and aims to investigate the maturity level of each organization so selected COBIT 4.1 processes as the assessment tool for this research. This empirical investigation and the adopted field procedure (case study protocol is illustrated in Chapter five - section 5.2) enabled the researcher to develop the SHIP-ITG model.

Research Philosophy	Description	Characteristics	Research Methods/tools	References
Scientific/Positivist	Assumes reality is objectively given and can be described by measurable properties independent of researcher and instrument used.	• Tends to produce quantitative data. • Concerns hypothesis testing, formal propositions, quantifiable measures of variables. • Seeks to test theory. • Drawing interfaces about phenomenon from sample to stated population. • Knowledge consists of facts that are independent. • Data highly specific and precise. • Location is artificial.	• Laboratory Experiments • Field Experiments • Surveys • Case Studies • Theorem Proof • Forecasting • Simulations	(Myers and Avison, 2002) (Crotty, 1998) D.Myers(2009) (Levy, 2006) Yin(2009) Orlikowski and Baroudi (1991) (Grix, 2002) (Feast and Melles, 2010)

Research Philosophy	Description	Characteristics	Research Methods/tools	References
Interpretivist	Seeks to describe, understand and translate the phenomena through meanings that people assign to them, which produce understanding of IS context and the process influenced.	• Understanding deeper structure of phenomenon within cultural and contextual situation. • Data is rich and subjective that can be through social constructions such as consciousness, shared meaning, documents and language. • What is researched can be affected by process of research • Tends to produce qualitative data. • Focus on full complexity of human sense-making as situation emerges. • Concerns generating theories. • Location is natural.	• Subjective/Argumentative • Reviews • Action Research • Descriptive/Interpretive • Future Research • Role/Game Playing	Becker and Niehaves (2007) (Galliers, 1992) Blaikie(1991) (Chen and Hirschheim, 2004)

Table 3. 1: IS Epistemology Stances adopted from (Ebrahim, 2005)

3.2.3. Theoretical Perspective

As mentioned in the previous paragraphs and in Figure 3.1: Four elements of the research process, understanding the nature of the research problem and the underlying assumptions behind 'valid research' is essential to justify the methodologies and methods

to be employed in the research design (D.Myers, 2009). Therefore, justification of the methodological choice relates to the theoretical perspective that underpins the research and is something that:

> ".. reaches into the assumptions about reality that we bring to our work. To ask about these assumptions is to ask about theoretical perspective" (Crotty 1998, p.2)

In addition, (Levy, 2006) pointed out that justifying methodological choice also reaches into understanding of what constitutes human knowledge, what kind of knowledge will be attained from the research and what characteristics this knowledge will have. Therefore, these issues rely on the epistemology informing the theoretical perspective and the type of methodology governing the choice of methods.

3.3. Research Process and Design

According to Yin (2009), research design is defined as "a logic that links the data to be collected and the conclusions to be drawn to the initial questions of study". Therefore, the design is the logical sequence or plan to guide the researcher to answer the defined questions and objectives until drawing its conclusions.

This section begins with discussing research motivations as in section 3.3.1. Then, the flow of this section uses Figure 3.2: Research design, as a guidance model to focus on the research process because this will form the plan of action and protocols. The first two stages were discussed earlier; however they will be presented again in sections 3.3.2 and 3.3.3 as part of the research design. Then section 3.3.4 presents the conceptual model developed through the theoretical and empirical investigation. The researcher justifies the selection of qualitative and quantitative methods in section 3.3.5. Next, section 3.3.6 presents the justification of using multiple Case Studies. Then sections 3.3.7, 3.3.8 and 3.3.9 will present justification of the selected number of case studies, data generation methods and data analysis. Section 3.4 presents research validity and reliability and finally concludes.

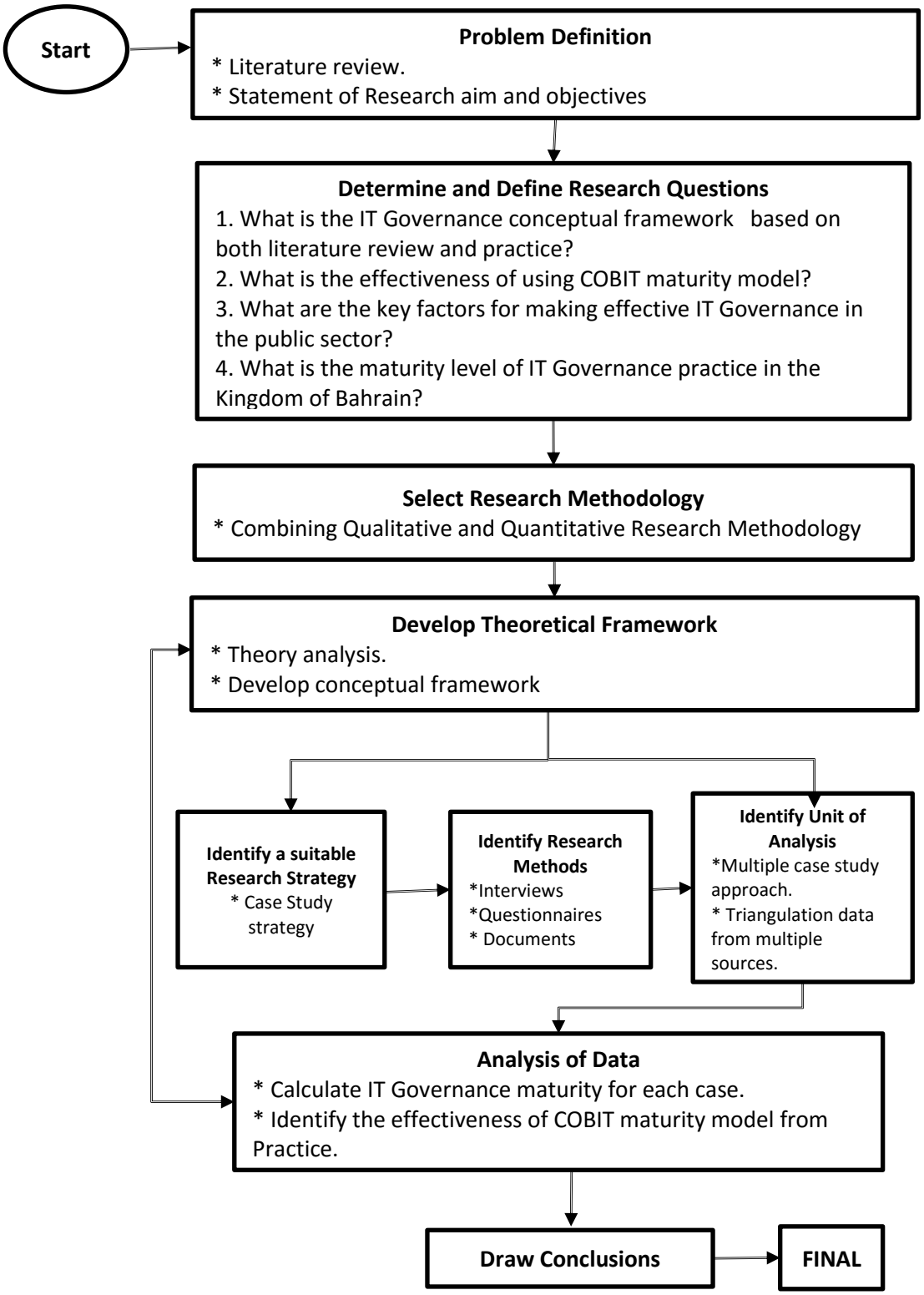


Figure 3. 2: Research design (adopted from Yin (2009))

3.3.1. Experience and Motivation

There are a variety of reasons for conducting a specific research topic. This can be answered from the personal experience and motivations which assist the researcher in developing research questions they plan to address (Oates, 2006). Understanding "why" specific research is being conducted will positively influence the researcher during the difficulties and frustrating times of the research journey. The researcher works as a Senior Specialist in the IT domain in the public sector which qualified her to gain insights into the gaps in IT processes that required investigating. For example, this is related to IT decision making, efforts in developing policies and standards, inconsistency of IT projects, lack of control of IT processes, roles and responsibilities and lack of proactive actions.

It was also mentioned in Chapter One (section 1.3) of this research study the detail of the importance of research and its potential findings. Therefore, this research is unique in that it covers IT Governance in the public sector (Simonsson, 2008, Ebrahim, 2005, Islamoglu, 2000, Isa, 2009). Moreover, research findings adopted from the examining of IT Governance Practice will feed into the work of the National ICT Governance Committee as well as the eGovernment Authority in Bahrain. In fact, this relationship is constructed through two members of the committee from both the Ministry of Education being the sponsor of this research and the local advisor, from the University of Bahrain.

Bahrain National ICT eGovernance Committee was established in 2011 by declaration of His Highness Shaikh Mohammed Bin Mubarak Al Khalifa, Deputy Prime Minister, Chairman of the Supreme Committee for Information and Communication Technology ((NEAF)), 2011). The committee includes a number of experts from various governmental bodies. The first meeting was held on November 13th 2011 and chaired by Mr.Mohammed Ali Al Qaed, Chief Executive Officer of the eGovernment Authority. The Bahrain National ICT eGovernance Committee is commissioned to specific goals, such as, responsible for setting high eGovernance standards for the deployment and utilization of ICT projects in the government entities, reviewing strategies, monitoring financial cost of ICT projects and reporting to the Supreme Committee for Information and Communication Technology (SCICT), in this respect for necessary action ((NEAF)) (News, 2011, Agency, 2011). In a statement Al Qaed said that "studies in this field proved

that the committee assisted in saving 20 to 30 percent of the IT budget in government establishments in the country by stopping the duplication in the implementation of IT projects between them" (Agency, 2011).

3.3.2. Literature Review

Researchers have to review the literature in their selected domain of study and various resources can be used; such as books, electronic journal articles, related conference papers and communicating with professionals in the field of the selected topic. During this stage, the researcher's ability to frame the conceptual model for research will be formulated (Oates, 2006). For the purpose of conducting this research all mentioned resources have been used and illustrated in detail in Chapter Two.

3.3. 3. Research question

Research questions keep the research focused and present the type of research and the kind of knowledge we aim to present as outcomes. Therefore, in the first step and for guiding the literature review search, the research questions were defined as a means to guiding the review. This was followed by placing the research objectives as illustrated in the next section. This thesis aspires to the following questions:

1. What is the IT Governance conceptual model from both literature review and practice?
2. What is the effectiveness of the COBIT maturity model in practice?
3. What are the key factors for making effective IT Governance in the public sector?
4. What is the maturity level of IT Governance practice in the Kingdom of Bahrain?

3.3.4. Objectives

In order to address the research aim, the following research objectives will be met:

1. To review and analyze literature in the IT Governance domain to identify the theoretical dimension and the importance of accountability in the public sector.
2. To develop a conceptual model for investigating IT Governance models in the literature review and practice using COBIT 4.1 maturity assessment tool survey developed by the researcher using two methods of data collection: face-to-face interviews and online questionnaire.
3. To identify the benefits and barriers of IT Governance (gaps) in practice by analyzing the COBIT 4.1 maturity assessment survey.
4. To identify the maturity level of IT Governance in the Kingdom of Bahrain and to represent conclusions based on the results generated from the assessment survey.

3.3.5. Conceptual Model

The conceptual model is the building blocks and the theoretical outcome of the learning process during the literature review stage. According to Oates (2006) examples of different factors that a conceptual framework might cover are:

- The different factors that comprise the topic.
- Derived from and justified by a study of the literature.
- The way of tackling research questions; the combination of strategies and methods adopted (research methodology).
- The way of thinking about the topic.

A major contribution of this research is the IT Governance conceptual model presented as the "SHIP-ITG Model", shown in Figure 3.3: ITG-SHIP Model, and available in details in Chapter Four. The model presents IT Governance dimensions and is constructed from theory and practice. The pyramid-shaped model has been informed by the Business Model

for Information Security for the initial investigation into IT Governance frameworks as explained in Chapter Two. Previous research has advocated that IT is integrated to business activity; therefore the boundary between pure business activity and pure IT support is non-existent and requires rethinking in IT Governance (Grembergen, 2004b). Understanding of the IT Governance concept is important because it establishes the boundary of this notation and the scope of IT Governance processes from theory to achieve it in practice or to bridge the gap between theory and real-life for functioning governance (Grant et al., 2007, Preittigun et al., 2012). The research investigated the current understanding of the IT Governance concept and was extended to further develop the various dimensions of IT Governance. The model can be used by both practitioners and researchers. For instance, this allows the organisation to gain a better perspective on IT Governance processes and provides a clear focus for management attention. The model may also be considered as a basis for further research in IT Governance in practice because previous studies in IT Governance were constructed through theoretical investigation. The focus in previous studies was on three important IT Governance dimensions, namely: structure, process and people (Denise and Dieter, 2010).

Therefore, this research study argues that IT Governance requires flexibility and fluidity as seen in the proposed model and not strict adherence to predetermined responsibilities and procedures, however commendable (Chan, 2002). Details of the SHIP-ITG Model are illustrated in the next chapter (Chapter Four).

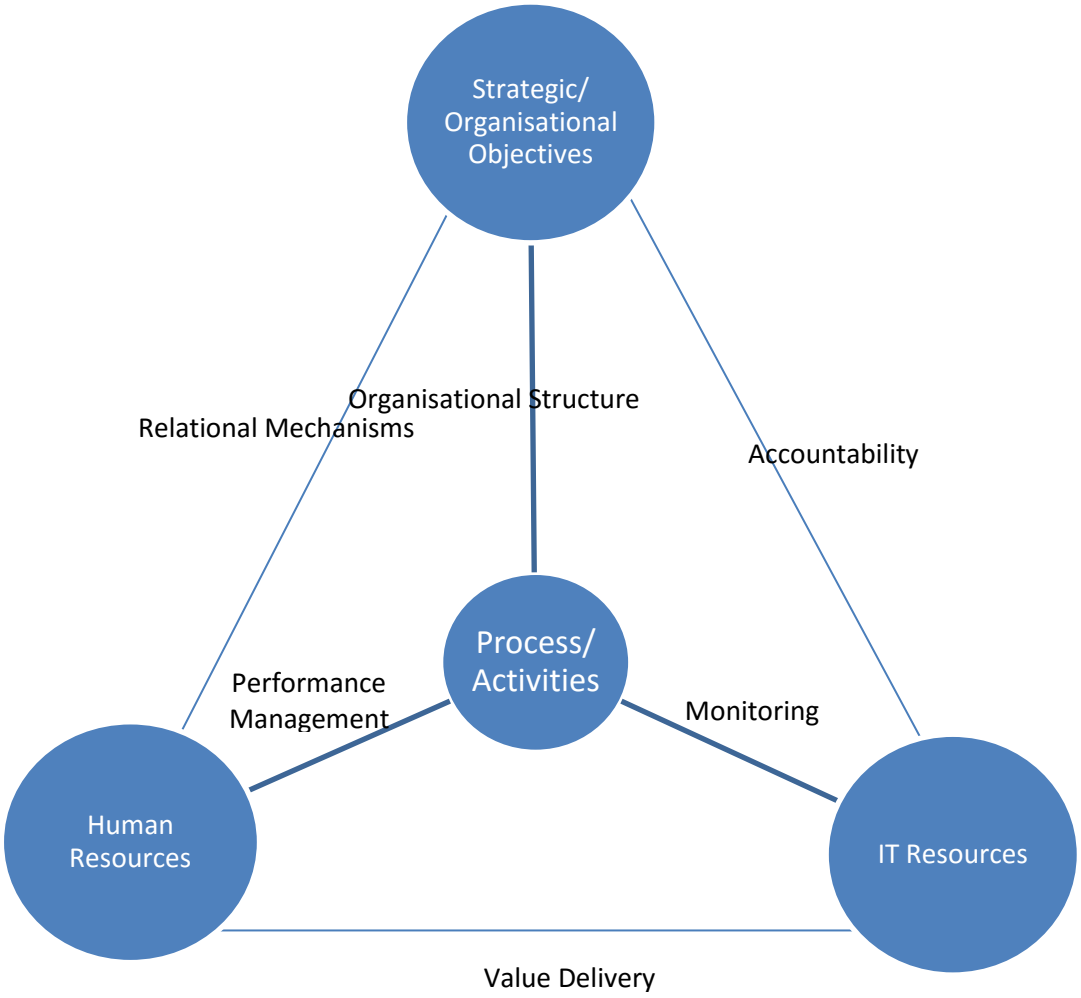


Figure 3. 3: SHIP- ITG Model

3.3.6. Qualitative and Quantitative Research Methodology

It has been justified in the previous section (section 3.2.2) that this research has characteristics of interpretivist and positivist philosophy approaches. Therefore, case studies with questionnaires will be used to generate quantitative data in addition to the qualitative data. This section will review these two methodologies, compare them and identify the strengths and weaknesses of each. Thus justification for selecting the combined methods approach becomes definite.

Both qualitative and quantitative research methodologies refer to a variety of methods of inquiry (Valsiner, 2005). Qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomena. Quantitative research methods, on the other hand, were originally developed in the natural sciences to study natural phenomena (Myers and Avison, 2002). Qualitative and quantitative research uses a set of common methods. Examples of qualitative methods include participant observations (fieldwork), interviews and questionnaires (Eisenhardt, 1989), documents and texts (Nfuka, 2012), and the researcher's impressions (Peppard, 2001) and reactions (Cho and Trent, 2006). The quantitative methods include survey methods (Orlikowski and Baroudi, 1991), laboratory experiments (Mary and Patrick, 2004) and numerical methods (Levy, 2006). Further, researchers have mentioned that there is an increasing interest in qualitative research methods due to the general shift in IS research away from technological to managerial and organisational issues (Benbasat et al., 1987). In order to gain a clearer understanding of these two research methods, it is necessary to illustrate the major characteristics, the strengths and weaknesses, of both methods as shown in Table 3.2: Strengths and weaknesses of qualitative and quantitative research. Then, in Table 3.3: Comparison between qualitative and quantitative research, presents that qualitative research methods can be used to better understand any phenomenon as well as to expand the knowledge on aspects of the phenomenon.

Myers and Avison (2002) propose that qualitative research can be positivist, interpretive or critical. It follows that the choice of a specific qualitative research method, such as the case study method, is independent of the underlying philosophical position adopted. Rather, as Orlikowski and Baroudi (1991, p.25) state:

> "Researchers should ensure that they adopt a perspective that is compatible with their own research interests and predispositions, while remaining open to the possibility of other assumptions and interests"

Domain	Qualitative Research	Quantitative Research	References
Strengths	• Allows the researcher to generate theories from practice.	• The analysis is based on well-established techniques, which gives confidence to findings.	(Ebrahim, 2005) Benbasat et al (1987) D.Myers (2009) Levy (2006) Kaplan (1988) Irani (1999) Crotty (1998) Mary (2004) Orlikowski and Baroudi (1991)
	• Allows the researcher to have thick and close description of the phenomena in context specific setting.	• The analysis is based on measured quantities and statistical tests can be checked by others.	
	• Allows the researcher to gain in-depth understanding of nature and complexities of processes.	• Large volumes of data can be analyzed quickly using software programs.	
Weaknesses	• Qualitative data predominantly textual with a richness that can be lost when aggregation or summarization occurs.	• There is a risk of doing some statistical tests without understanding them properly.	
	• Time-consuming because the researcher must spend lengthy amount of time on data collection process and data analysis.	• By focusing on what can be measured, non –quantitative aspects of research topic may be missed.	
	• Data open to a number of interpretations which can reduce accuracy of interpretation results.	• Many decisions taken by the researcher can influence the results.	

Table 3. 2: Strengths and Weaknesses of Qualitative and Quantitative Research

Therefore, this research adopted combined methods. Combining qualitative and quantitative methods introduces both testability and context into the research. Further, collecting different kinds of data by different methods from different sources provides a wider range of coverage that may result in a fuller picture of the unit under study than

would have been achieved otherwise (Kaplan and Duchon, 1988, Kaplan et al., 2004). Similarly, (Nel, 1997) used as an approach the integration of case studies and survey to investigate IT investment management process model and allowed the identification of context-specific variables. Moreover, researchers point to a number of distinct advantages that can be derived from combining qualitative and quantitative techniques, such as more refined and relevant conceptualization, better understanding of residual unexplained variance, more valid empirical indicators, more meaningful interpretation of quantitative data and finally new theoretical insights (Fry et al., 1981, Kaplan and Duchon, 1988, Chen and Hirschheim, 2004, Eisenhardt, 1989). Therefore, the multiple and different kinds of data and sources increases the strength of the results because findings can be validated through triangulation.

Triangulation is a method used by qualitative researchers to check and establish validity in their studies by analyzing a research question from multiple perspectives (A.Guion et al., 2011). There are five types of triangulation, specifically data triangulation, investigator triangulation, theory triangulation, methodology triangulation and environmental triangulation.,A.Thurmond (2001, p.254) mentioned that the benefits of triangulation include:

> "Increasing confidence in research data, creating innovative ways of understanding a phenomenon, revealing unique findings, challenging or integrating theories, and providing a clearer understanding of the problem".

These benefits largely result from the diversity and quantity of data that can be used for analysis. Consequently, a primary disadvantage is that it can be time consuming. This is because collecting more data requires greater planning and organisation resources are not always available for the researcher. Moreover, Thurmond (2001, p.256) points to other disadvantages:

> "Possible disharmony based on investigator biases, conflicts because of theoretical frameworks and lack of understanding about why triangulation strategies were used".

In this research, data, theory, and methodological triangulation will be used. These terms are defined as follows:

- "Data triangulation involves using different sources of information in order to increase the validity of the study" (A.Guion et al., 2011). In this extension, this research uses different participants according to the IT organisational structure. This yields different inputs to the same COBIT process investigated and from different organisations' case studies.

- "Theory triangulation involves the use of multiple perspectives to interpret a single set of data". One popular approach is to bring together people from different disciplines; however, individuals within disciplines may be used as long as they are in different status positions (A.Guion et al., 2011). In this research, different participants from different IT positions are selected.

- "Methodological triangulation involves the use of multiple qualitative and/or quantitative methods to study the program" (A.Guion et al., 2011).

Accordingly, combined methods are appropriate in this research. In addition to the strength and benefits presented in Table 3.3: Strengths and weaknesses of qualitative and quantitative research, the following key points will summarize the reasons for this:

- Since the concept of IT Governance is a little-known phenomenon, the qualitative method will allow for understanding and examining in depth the Information Technology Governance from theory and in practice.
- Understanding IT Governance in practice will require close connection with people and working environment within the public organisations through interviewing and surveys/questionnaires.

- Identifying the IT Governance maturity level requires distribution of COBIT 4.1 assessment to the selected sample in each organisation. Therefore, multiple data sources will be generated and analyzed using a software program.

Characteristics	Qualitative Research	Quantitative Research	References
Purpose	To understand and interpret social interactions.	To test hypotheses, look at cause and effect, and make predictions.	(Ebrahim, 2005) Benbasat et al (1987) D.Myers (2009) Levy (2006) Kaplan (1988) Irani (1999) Crotty (1998) Mary (2004) Orlikowski and Baroudi (1991)
Research Focus	Examines full context of the phenomena, interacts with participants.	Uses large sample, tests a specific hypothesis.	
Research strategy	Open ended responses, interviews and unstructured.	Closed, structured and validated data collection instruments.	
Group Studied	Smaller not randomly selected.	Larger and randomly selected.	
Research methods	• The researcher generates a new hypothesis and theory from the data collected. • Participant observations (fieldwork), interviews and questionnaires, documents and texts, and the researcher's impressions and reactions.	• The researcher tests the hypothesis and theory with the data. • Survey methods, laboratory experiments and numerical methods and mathematical modelling.	
Nature of data	Rich, deep and complex	Hard, rigorous and reliable	
Data analysis	Interpretive and descriptive	Statistical	

Table 3. 3: Comparison between Qualitative and Quantitative Research

3.3.7. Selecting Appropriate Strategy

3.3.7.1. Case study Research Method

There are a number of variant research strategies available, such as surveys, experiments, simulations, case study, action research and ethnography. The research strategy that will be adopted in this research is case study strategy to investigate IT Governance processes in practice. This will provide an opportunity to investigate IT Governance practice through interviews, questionnaires and document analysis.

Case study is the most common method for qualitative research and mostly suitable for information system research as a result of moving from technical to organisational IS related issues (Benbasat et al., 1987, Ebrahim, 2005, Myers and Avison, 2002). According to (Yin, 2009), case study definition can be twofold; scope of the case study and technical definition of case study. These are illustrated as follows:

1. A case study is an empirical inquiry that:

   > "Investigates a contemporary phenomenon in-depth and within its real life context, especially when the boundaries between phenomenon and context are not clearly evident" Yin (2009, p.18)

2. The case study inquiry

   > "Copes with the technical distinctive situation in which there will be many more variables of interest than data points, and as one result relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result benefits from the prior development of theoretical propositions to guide data collection and analysis" Yin (2009, p.18)

Authors (Benbasat et al., 1987, Galliers and Land, 1987, Myers and Avison, 2002, Yin, 2009) in the domain of research methodology argue that case study research questions always seek the 'why ?', 'how ?', or 'what ?'. They also argue that the way these research questions are structured has a direct impact on the selection process of the appropriate research strategy. They position case studies into three divisions or research

concepts: descriptive, exploratory and explanatory. A descriptive case study is used when cases require a descriptive theory to be developed before starting the project and research questions are labelled by key words “what” and “how”. This is similar to the study of Castillo and Stanojevic (2011). Exploratory cases are sometimes considered as a preface to social research and research questions focus on “what”. Researchers with this type of case study research investigate a phenomenon within multiple case studies such as Olson (1981) and Pyburn (1983). Finally, explanatory case studies are used for casual mechanisms, which is central to scientific realist epistemology; the research questions are labelled “how” and “why” (Levy, 2008). An example of this type is the study conducted by Markus (1981) who examined the use of a “production planning and profit analysis system” in two manufacturing plants within the same division of a company. In this example, Markus proposed a model to explain the different reactions to the system and was interested in answering the question: why was the system used in one plant and not in another? He traced the evaluation of the system’s implementation from rejection to acceptance with clear justifications for this switch.

The present thesis has scientific and practical interests for exploring a phenomenon (i.e. IT Governance: practice, dimensions and maturity), and demonstrating the subject of investigation in its context and environment (i.e. IT Directorates within a public sector organisation) which requires clear evidence of the phenomenon and its context. Therefore, the following can justify the use of case study strategy:

- IT Governance can be studied in a natural setting or “lived reality”. This will add to the learning gained, and then generate relevant theory from understanding the IT Governance practice. Thus, case studies can facilitate rich conceptual /theoretical development.
- Since IT Governance in the public sector in the Kingdom of Bahrain is not well known, the case study research provides early exploration when investigating the maturity level of each organisation. Thus this can help in understanding the complex inter-relationships between theory and practice from multiple sources of data.

- The case study will answer the research questions illustrated in the previous sections; the type of what, why and how questions. As the research questions focus more on what type, exploratory case study is useful for theory building. Besides, investigating the maturity level of IT Governance practice requires numerical and mathematical calculations so IT departments are approached in each case study.
- Case approach is an appropriate way to achieve the objectives of this research since few previous studies have been carried out in IT Governance Practice in the Kingdom of Bahrain considering the rapid pace of change in the IS field. Therefore, valuable gains can result from the insights through use of case study research.

Many authors have commented that each research strategy has advantages and disadvantages in such a way that there is no single appropriate strategy for all research purposes (Benbasat et al., 1987). Hence, it is important to balance the selection of case study research with briefing some of its disadvantages as stated by (Hodkinson, 2001):

- Case study contains too much data, therefore there should be wise decision making to look into the generated data from the interviews and decide which analysed data will produce a contentious issue. Therefore, it is common to choose the most important and interesting to analyse and write about.
- The complexity examined is difficult to represent simply because it would be difficult to present an accessible and realistic picture of complexity in writing.
- Time-consuming to collect data and time-consuming to analyze if attempted on a large scale.

Thus, despite the disadvantages presented, the results have a very high impact and many researchers continue to use a case study research method (Yin, 2009). Accordingly, the nature of the research reported above indicates that case study research strategy is the appropriate approach in which qualitative and quantitative data will be collected (Ebrahim, 2005, Castillo and Stanojevic, 2011).

3.3.7.2. Multiple Case Studies

Three basic types of case studies exist: exploratory, descriptive and explanatory. As stated by (Oates, 2006), “an exploratory study is used to define the questions or hypotheses to be used in a subsequent study”. This approach helps the researcher understand the problem. The second approach is descriptive study which “leads to a rich, detailed analysis of a particular phenomenon and its context. Finally, explanatory study “explains why events happened as they did or why particular outcomes occurred”.

Each of the above mentioned case approaches can use a single case or multiple cases. (Irani et al., 1999) point out that the study of a single case enables investigating and getting close to phenomena, which allow for rich description of primary data, full analysis and identification of the structure of phenomena. Yet, single case studies have limitations; such as, limits the generalisability of the conclusions, and models are developed from one case study. In contrast, a multiple case study approach may reduce the depth of the study when resources are constrained and may not enable a similar degree of rich analysis of phenomena, yet, helps guard against observer bias and enables differences in context to be related in process and outcome (Irani et al., 1999, Ebrahim, 2005).

Therefore, a multiple case study approach is particularly appropriate for this research because a single case study may not provide adequate data but can be used as a pilot for exploration followed by multiple case studies. Benbasat et al.(1987, p.369) mentioned that case research is appropriate for “sticky practice based problems where the experiences of the actors are important and the context of action is critical”. They also mentioned that this research approach enables the researcher to study in natural settings, learn about the state of art and generate theories from practice. Additionally, multiple case studies enable a more effective validation of findings as the analysis of data across organisations is possible. Consequently, the analytic conclusion will be more powerful and robust because IT Governance practice investigation will move from one organisational context to another making for powerful “theoretical” and “literal” replication (Benbasat et al., 1987).

3.3.7.3. Number of Case Studies

Selecting the number and which case studies to undertake have been considered a difficult element in case study research and a subject of debate. Authors such as (Eisenhardt, 1989) suggested that four to ten useable sites are necessary for case study research. However, another study by, (Stuart et al., 2002) suggested having one to three cases. They both argued that as far as an upper limit is concerned, the guiding principle has more to do with diminishing return rather than expanding beyond a dozen sites.

Moreover, a previous study conducted by (Ebrahim, 2005) in the Kingdom of Bahrain had three cases. Ebrahim (2005) justified his approach to this limit because of the nature of the proposed strategic framework of e-government and the adoption process. Another example is Olson (1981) who chosen two sites from each system development function (centralized and decentralized) to examine the influence of strategy on structure.

Therefore, considering the research questions and objectives, it was important to identify factors influencing the adoption of each of the four selected processes. Consequently, this research employed multiple case studies, which is five case studies. The reason for this selection is that the research is using COBIT 4.1 maturity model and selected 18 processes. Each process is further divided into a set of statements and this will further produce huge data from each case. The collected data from multiple case studies is necessary to identify the maturity level of IT Governance Practice in the public sector in a single site (country). Consequently, five government organisations located in the Kingdom of Bahrain were approached.

3.3.8. Case Study Data Collection

There are multiple data collection methods that can be employed in case research study and this decision can be taken once the research strategy has been decided. Such methods, as pointed out by Yin (2009) and Benbasat et al.(1987), are documentation, archival records, interviews, direct observations, participant observations and physical artefacts. Benbasat et al.(1987) declared that evidence from two or more sources will converge to

support the research findings. Therefore, this research used multiple methods for data collection because the underlying principle in the collection of data in this research is triangulation. Triangulation is a good source for validity because the researcher searches for convergence among multiple and different sources of information to form the themes or categories in a study (Creswell and Miller, 2000). This combination of data sources, theory and methodology results in data triangulation, theory triangulation and methodological triangulation as illustrated in an earlier section (Section 3.3.5: Qualitative and Quantitative Research Methodology).

Research questions identify the type of data to be collected and the appropriate methods to use (Benbasat et al., 1987). In this research, the research questions seek to identify the maturity level of IT Governance Practice and the effectiveness of using the selected framework; consequently, multiple sources of evidence, interviews, observations, documents analysis and questionnaires, are the appropriate data sources used. Further, comparing this research approach to Ebrahim's (2005) study, it can be noted that interviews and document analysis are used and considered the most common and powerful data sources for interpretive case study research.

Therefore, in this research a COBIT assessment tool is used firstly as a basis for conducting semi-structured interviews and questionnaires for 34 processes. Accordingly, and along with both the learning process during this research journey and experience gained from empirical site data collection process, an interest conflict has been noted. In this view and due to time consuming and precious data or data not being organized, an alternative online survey tool (web-based) has been developed. The questionnaire was built on selecting 18 of the most important processes of COBIT. The selection of 18 out of 34 processes was followed by a mapping process to the IT Governance domain (as illustrated within Table 3.4: Mapping 18 processes of COBIT into IT Governance Focus Areas). The mapping was informed by the work of ISACA committees COBIT assessment tool (ISACA, 2011). For each maturity level of the 18 selected processes, participants select answers indicating their agreement with the statements, such as, Not at all, A little, Quite a lot or Completely.

Level	Process	IT Governance Focus Area				
		Strategic Alignment	***Value Delivery***	***anage Resources***	***Manage Risk***	***Manage Performance***
1	P01: Define a Strategic IT Plan	√				
2	PO3: Determine Technological Direction			√		
3	PO5: Manage the IT Investment		√			
4	P07: Manage IT Human Resources	√		√		
5	P08: Manage Quality	√				
6	PO9: Assess and Manage IT Risks	√			√	
7	P010: Manage Projects	√				
8	AI2: Acquire and Maintain Application Software	√	√			
9	AI5: Procure IT Resources			√		
10	AI6: Manage Changes		√			
11	DS1: Define and Manage Service Levels	√	√	√		√
12	DS4: Ensure Continuous Service		√		√	
13	DS5: Ensure System Security				√	
14	DS10: Manage Problems		√			
15	DS11: Manage Data		√	√	√	
16	ME1: Monitor and Evaluate IT Performance					√
17	ME2: Monitor and Evaluate Internal Control		√		√	
18	ME4: Provide IT Governance	√	√	√	√	√

Table 3. 4 : Mapping 18 processes of COBIT into IT Governance Focus Areas

This technique of classifying the agreement with statement (pre-coded) has been informed by previous works conducted by Pederiva (2003) and Guldentops et al.(2002) to measure the maturity of IT processes using the COBIT maturity model. The electronic version of the surveys has also provided ease of communication and reporting. The selected methods are further illustrated in the next paragraphs:

3.3.8.1. Interviews

Interviews are commonly noted as the most important sources of case study information (Yin, 2009). Interviews are described as suitable data generation methods when a researcher aims to obtain detailed information, ask questions that are complex or open-ended, and in case a researcher wants to explore experiences or emotions that cannot easily be observed or described via pre-defined questionnaire responses as declared by Oates (2006). Interviews are commonly divided into three types, and the researcher needs to decide which type will fit into the research design imposed and described as follows:

- Structured interviews: Uses pre-determined and identical questions. The researcher reads the question and notes the interviewee's responses often by pre-coded answers.
- Semi-structured: The researcher uses pre-determined questions, but is willing to change the order of questions depending on the flow of the conversation, therefore can speak in detail on some introduced issues normally known as 'open-ended'.
- Unstructured interviews: The researcher starts by introducing the topic and letting the interviewees develop their ideas. The role of the researcher is to guide this conversation rather than control it.

In regard to the context of this research, the main purpose for conducting interviews was to provide the background information, data and to investigate IT Governance Practice within the public sector. Throughout this investigation process, the participants were interviewed face-to-face by using semi-structured interview method to identify the main duties assigned to their position and titles. This was followed by assigning the relevant

pre-determined questionnaires built based on the COBIT framework; however, the participants freely spoke in detail when introducing issues related to their domain. For instance, Yin (2009) introduced this type of case study interview as a 'focused interview' in which a person is interviewed for a short period of time remaining in an open-ended conversational manner.

Today, the rapid pace of change in IS and the advances in Web-based technology have introduced alternative ways for conducting interviews, through the Internet. This procedure evolved due to a conflict of interest when many interviews were postponed. The researcher committed to the research plan and scheduled alternative methods to resolve the cases with "busy schedule" and not being able to perform face-to-face interviews. Consequently, this involved web-based software and transferring the questionnaires over, then inviting the participants through their email addresses.

3.3.8.2. Documents

Documents are also considered a source of data collection and are commonly divided into two types according to Oates (2006):

- Founded documents are those existing prior to the research, such as the documents found in most organisations, such as, job descriptions and procedure manuals.
- Researcher-generated documents are put together for the purpose of the research task, such as field notes about observed thoughts, photographs, models and diagrams. A particularly important source is record-keeping as in a "research journey" for recording and capturing daily tasks, processes and planning for the next set of tasks.

Both organisations and individuals produce useful sources of data. For instance, minutes of a meeting, informal communications including memos and emails are examples of documents that an organisation produces. On the other hand, there are useful sources of

data that an individual produces, such as, personal papers and communications including diaries and emails.

In the context of this research, firstly, documents provided the basic information for verifying the titles and structure of the organisation. Secondly, documents provided the details to corroborate information from other sources, such as previous research that can be reused, academic literature including books, journal articles and conference papers. Mendeley software was used in this research for generating a database of the literature covered during the research journey. This Mendeley database can be considered the search engine or analysis method for the researcher in investigating the literature for specific words, for instance in building the conceptual model references as shown in Chapter Four.

3.3.8.3. Questionnaires

According to Oates (2006, p.219) a questionnaire is "a predefined set of questions assembled in a pre-determined order". Therefore, in this research, the COBIT framework was the source for developing the questionnaire and providing the data that can be analyzed and interpreted. The questionnaires can be considered both researcher-administered and self-administered. The former, for instance, is the preferred approach in this research because the face-to-face communication and conversation provide answers to the questionnaires along with the opportunity to discuss with participants the topics introduced; therefore, the researcher can record useful and rich observations. In contrast to the latter where the participant completes the questions by communicating through email without the researcher being present. The intention to use the self-administered questionnaire in conjunction with the researcher-administered questionnaire was due to a conflict of interest when many interviews were postponed as a result of busy schedule as illustrated in the previous paragraphs. Moreover, Oates (2006, p.221) points out that "most questionnaires are self-administered, which saves the researcher's time and means that more people can be asked to complete the questionnaire".

The use of self-administered questionnaire in this research required providing some clarifications for the participants on telephone, or setting alternative appointments for the face-to face interview method to complete the questionnaire.

The content of the questionnaire for this study was derived from the COBIT maturity model, and it relies on description or 'scenario' concept because every maturity level is considered to be a scenario. The questionnaire is intended to capture the responses from cases under investigation to the scenarios describing each maturity level. For the purpose of arranging the questionnaire, the maturity level of the COBIT maturity model was studied and informed by previous research in this field as mentioned in the work of (Pederiva, 2003). Therefore, the questionnaire used closed questions to force the respondents to choose from a range of answers that were pre-defined (Oates, 2006). By this, each maturity level is considered a set of statements that participants select answers to, indicating their agreement with the statements, such as, Not at all, A little, Quite a lot or Completely. The assessment value result can be computed for each maturity level by combining the values for each statement in an Excel sheet and then being given a weight (which is its level). Therefore, the maturity level description (scenario) was split into separate statements and all statements in the maturity level description were separate in the questionnaire (Pederiva, 2003, Guldentops et al., 2002).

3.3.9. Data Analysis

As stated in the previous sections, the type of data collected in this research is qualitative and quantitative in nature. The process of qualitative data analysis is fundamentally non-mathematical in nature. Accordingly, qualitative requires working with data, organizing them, breaking them into manageable units, searching for patterns, discovering what is important and what is to be learned and therefore getting findings. Some of the interviews were tape recorded and translated into Arabic. Moreover, in the initial proposal of the research, Nvivo tool was investigated to assist with the analysis of qualitative data; however, it was difficult to purchase the software license for conducting a split-site study. Moreover, in respect of the experience gained and learning process during the research journey, web-based software was

introduced for the quantitative data collection obtained from the IT Governance assessment tool derived from the COBIT maturity model (Guldentops et al., 2002).

Hence, for the purpose of investigating the appropriate tool for data collection and analysis, a search into the use of COBIT assessment was performed. Simonsson et al.(2007) present a COBIT based method for Information Technology Governance (ITG). This assessment method aims to enhance and manage the existing ITG processes and structures with providing good monitoring technique for decision and action. The authors argued that "COBIT did not fulfil all requirements for good ITG maturity assessment method". The proposed method was tested on a medium-sized case study in Sweden. Results for ten processes from the Plan and Organize domain are presented in the paper, however the analysis tool and method was not mentioned. In (Larsen et al., 2006), the authors reviewed 17 IT Governance tools and selected one assessment tool most appropriate for case evaluation (ITIL, COBIT, ASL, Six Sigma, CMM/CMMI, IT Service CMM, SAS70, ISO 17799, SOX, SysTrust, PRINCE2, IT Audit, IT Due Diligence, IT Governance Review, IT Governance Assessment, IT Governance Checklist, IT Governance Assessment Process). The case study sites are in three different locations (US, China and Denmark) as adopted and informed by Weill and Ross (2004).

As mentioned earlier, a web-based method was essential to influence participants to commit to this study after several attempts to conduct face-to-face interviews. Therefore, SurveyGizmo is used in this research. Comparing with other available online software (Table 3. 5: Comparing online survey software products. Sources from (TechMediaNetwork, 2013, SurveyGizmo, 2005-2013), this software provides a reasonable subscription fee for students for the basic level of features, an easy tool to immediately generate distinct questions, and reports different methods of transferring data, such as Printable PDF versions. Moreover, SurveyGizmo has a good reputation in customer support (SurveyGizmo, 2005-2013).

Tool name	Features	Comments
The Survey System	• Windows based • Flexible analysis and administration methods • simple in-house questionnaires or complex surveys designed for widespread distribution	It takes some time to learn to use
Survey Pro	• Integrated multimedia survey solution • One-stop edits • Polished presentation of surveys • Database integrates with other applications • Sophisticated reports • Flexible filters, cross-tabs, and sub-group analysis • Analysis of open-ended comments • Unlimited respondents and surveys, no annual fees • Unparalleled in-house technical support	Interface is a bit old-fashioned with small text and icons. Learning to use this survey software is tricky and takes time.
SurveyMonkey	• Easy-to-use web-based survey tool • 51 survey templates • 15 types of questions • Custom "thank-you" page • Printable PDF version	Has frustrating reputation in responding to support requests.
SurveyGizmo	• Great customer support • Provides variety of question types both simple and advanced • Ability to send an email at certain points during the survey as response to a certain action • Real time reporting feature • Provides reasonable discounts for students • Printable PDF version	Easy to learn and use immediately.

Table 3.5: Comparing online survey software products.

Sources from (TechMediaNetwork, 2013, SurveyGizmo, 2005-2013)

3.4. Research Validity

This research study used routine validation processes through the different research stages. Recalling that the research adopted both qualitative and quantitative research methodologies, validity in qualitative brings a different lens to that brought by quantitative studies, as mentioned by Creswell and Miller (2000). They mentioned a clarification between the two types. Investigators within quantitative research consider the specific inferences made from the test scores on instruments, whereas qualitative researchers use the views of people who conducted, participated in, or read and reviewed a study. For example, Patton (1980, p.339) clarifies that researchers in qualitative analysis may return to their data "over and over again to see if the constructs, categories, explanations and interpretations make sense". A second lens is established when the study uses participants. Therefore, this lens suggests the importance of checking how reality has been represented and involves participants in assessing whether the interpretation accurately represents them. The final lens is use of an external individual, such as reviewers not affiliated within the study, to help establish validity and creditability (Creswell and Miller, 2000).

Thus, this research study considered the validity lenses and used different types of validity procedures as justified in the next paragraphs.

- **Member checking**

  The validity procedure within member checking shifts from the researchers to the participants in the study. This method has been described as "the most crucial technique for establishing creditability" in a study as mentioned by Lincoln and Guba (1985, p.314).

  Therefore, several procedures were adopted. First and before using the questionnaire in a natural setting, a pre-test and a pilot experiment were conducted. The pre-test is the process where the content of the questionnaire is shown to people who are experts or work in the same research domain, therefore can provide assistance in improving the questionnaire. The questionnaire was sent out for evaluation in the research domain to two academics from the University of Salford, the research Supervisor Dr. Marie Griffiths and Mr.KH.Subirahmaniam. The local advisor from the University of Bahrain

has also reviewed this tool. They concluded that no improvement or refining was required.

Secondly, the research also performed a pilot experiment to further receive assistance to refine the data collection plans with respect to both the content of the data and procedures to be followed (Yin, 2009). Therefore, a pilot experiment was conducted with some colleagues similar to the intended participants. This stage is known as a mini version of the study for refining a particular research instrument such as a questionnaire or interview schedule. According to Oates (2006), the researcher gains a set of advantages from conducting a pilot experiment:

- Whether people have some difficulties in answering certain questions.
- Whether some questions are ambiguous.
- Whether people find it easy to answer and follow instructions.
- Whether the pre-defined responses cover all desired answers.
- The estimated time to complete it.
- The selected processes are most important to public sector organisations.

Thus, the observations taken from the pilot experiment are:

- The estimated time for the interview took around one hour and required translations of some terminologies.
- Investigate the background of the interviewee's work to fit in the questionnaire process, or investigate and collect the organisational chart for the IT department in each sector to standardize the questionnaire.
- Prepare a short presentation on COBIT processes for the group.
- Ask for Mandates/IT steering committee if exist.
- Ask whether the interviewee has heard about COBIT framework or any other existing frameworks.
- Identify the interviewees' opinion on the benefits of implementing IT Governance and the key factors for a successful implementation.

In addition, the researcher performed a blind test with a group of co-workers and the IT Director. The researcher placed the previous IT Governance models and the proposed model in sequence to explain the IT Governance concept. The researcher gave a brief on their participation in data collection and results. The aim of this practice was to answer the question: which model explains the IT Governance concept? And why?

Finally, the researcher tested the SHIP-ITG Model in the IT Directorate in the MoE with senior colleagues. At start, the researcher introduced the SHIP-ITG Model with its four elements, six interconnections and the scaling criteria's (as illustrated in Chapter Four). The researcher distributed the SHIP-ITG assessment sheet developed by the researcher to record answers (as in Chapter Four in Figure 4.1: SHIP-ITG agreement criteria table). Each participant represented his section and the IT Director represented the Direcrtorate. The researcher provided helped and assistant in any questions or clarifications within this practice. The researcher calculated the maturity results for each sections and an overall result using similar algorithm mention in Chapter Six. This benchmarking result enabled decision-makers to understand their current IT Governance position and plan for the next stage in an easy steps and efficient time manner.

- **Triangulation**

The researcher searches for convergence among multiple and different sources of information to form themes or categories in a study (Creswell and Miller, 2000). In this research study different types of triangulation have been identified. First of all, triangulation investigated across data sources; for example participants, in different roles with different experiences and from five public sector organisations. Theories and methodology are both triangulated through replicated interviews, observations and documents among the five case studies.

- **Prolong engagement in the field**

In this type of validity procedure, the researcher stays at the research site for a prolonged period of time working with people on a daily basis (Creswell and Miller, 2000). During this repeated observation, the researcher builds trust with participants to find the key personnel to allow access to people and sites. Therefore, participants are comfortable in disclosing information. This is important in gaining a holistic and tight case because the researcher compares interview data with observational data.

In this research study, the researcher obtained access to five large and critical public sector organisations and communicated directly with a selected number of participants among different roles and responsibilities to get insights into the selected 18 IT processes adopted for this study.

- **Peer debriefing**

A peer review is the review of data and the research process by someone who is aware of the research or phenomenon being investigated (Creswell and Miller, 2000). The researcher prepared four research papers contained within the different research design stages and attended three conferences to present the work (details of conferences are illustrated in Chapter One and some photos are available in Appendix C: Participation at Conferences). This provides support and a challenge for the next stage because of the close collaboration between the external reviewer and questions asked during the presentations in conferences. This process is considered "best used over time during the process of an entire study" as mentioned by Creswell and Miller (2000, p.129).

3.5. Conclusions

The aim of this chapter was to provide the rationale for the appropriate research methodology. Since the IS domain is rapidly developing, attention is given to the methods employed to justify the claim that something has been added to the body of knowledge (Ebrahim, 2005).

The research undertaken in the IS domain for this dissertation requires a clear methodological clarification so results of the research are credible and convincing.

This research study employed a research strategy for the purpose of theory building with the use of interpretive and positivist epistemological stances. The researcher has justified the use of the integrated approaches as mutually supportive (Lee, 1991). The researcher explained the combining of qualitative and quantitative methods as the proper approach to investigate an unknown phenomenon in its natural settings. The researcher also justified the use of multiple case studies to investigate IT Governance practice through a series of interviews, observations, documents and questionnaires. Then the researcher described the validity of the study being enhanced through the use of multiple sources of information, the review of draft case reports by the interviewees, and the use of a standardized case study protocol. In addition, the researcher validated the SHIP-ITG model in one case study and calculated the maturity result as shown in Appendix D. The next chapter will present the SHIP-ITG Model.

Chapter 4

The Conceptual Model for IT Governance in Public Sectors (SHIP-ITG Model)

Despite the attention given to the IT Governance topic, there is still confusion as to what IT Governance is and how it may be implemented in practice, and that an ideal model has remained somewhat convoluted and confused (Grant et al., 2007). In Chapter Two, the researcher identified an overview of why this topic continues to garner further research. Therefore, the background of the IT Governance context enabled and supported the researcher to understand the extended needs of IT Governance dimensions. In this chapter, the researcher proposes a dynamic, interdependent and holistic model for implementing IT Governance entitled the "SHIP-ITG model". This model is built upon the researcher's subjective interpretations of the literature review stage. The researcher moved to another stage (as illustrated in Chapter Three in section 3.3: Research process and Design) for conducting empirical investigations to assess the maturity of IT Governance practice (Chapters Six and Seven of this dissertation). Therefore, this provides an integrated opportunity for the researcher to make observations on the proposed conceptual model and is considered a good source to validate the model. This is an interactive process between the researcher and the collected data as the emphasis is on both theory and practice (Cho and Trent, 2006). The proposed model can be used by public and private sector organisations and allows IT Managers/Directors to better identify and implement the concept of IT Governance.

4.1. Introduction

The aim of this chapter is to develop a conceptual model for IT Governance for public sector organisations. The proposed conceptual model can support the implementation process of IT Governance in a complex context like public sector organisations.

At the beginning of this chapter, the researcher presents a background summary on IT Governance. Next, in Section 4.3, the researcher identifies from the literature review the most widely adopted models. The stream of available research provides generalized alignment and integration mechanisms for organisational decision makers. Then in Section 4.4, the researcher introduces and justifies the proposed conceptual model for IT Governance (SHIP-ITG Model), which extends the existing models. The model consists of four elements (Strategic Objectives, Human Resources, IT Resources and Process) and six interconnected relational links (relational mechanisms, performance management, accountability, monitoring, value delivery and organizational structure). Further, the researcher developed maturity criteria to enable calculation models and organisations for assessing their current maturities and to plan for improvements.

The researcher then concludes that understanding the IT Governance concept is essential to implementing IT Governance because it establishes the boundary and the scope of IT Governance processes. The researcher believes that such an understanding of the different working root elements in the proposed model is an essential stage so that this SHIP can lead to the next level.

4.2. Background

The term IT Governance has been inherited from the corporate governance discipline and is broadly acknowledged in the IS discipline to represent the way organisations structure and manage IT Resources. The topic captured the attention of researchers and practitioners and consequently has slowly emerged as a discrete discipline. Key areas of research in this discipline of IT Governance have shown a distinct link between effective IT Governance and organisational performance (Ross and Weill, 2004c). Other research efforts focus on the development of models of IT Governance (Dahlberg and Kivijarvi, 2006, Grant et al., 2007, Peterson, 2004b) and still others on the IT Governance concept and dimensions, namely: structure, process and people (Denise and Dieter, 2010). Indeed, commonly IT Governance is deployed using a mix of structures, processes and relational mechanisms. However, little research addresses the implementation of the IT Governance stage and leaves a clear gap between the theoretical musing, real-life and contemporary practice (Grant et al., 2007).

Despite this academic and practitioner attention on the IT Governance field, studies admit that there is still a struggle to develop a coherent synthesized conceptualization of this intangible notation (Grant et al., 2007). Other studies also declared that there is still confusion on what IT Governance is and how it may be realized in practice as this ideal has remained an ephemeral phenomenon (Peterson, 2004a). However, the rapid development in the IS field leads to certain questions usually introduced in daily boardroom meetings when addressing the IT Governance concept. Yet, leading answers provide little clarity and are often unsatisfactory.

Therefore, this research draws on existing research related to IT Governance and proposes the SHIP-ITG Model. This model aims to create a real-life working environment as argued by (De Haes and Grembergen, 2005). The conceptual mapping considered rich sources to help researchers produce and describe their ideas about some topics in pictorial form. The next section will present commonly used IT Governance models and explain what IT Governance elements have been investigated.

4.3. Overview of previous IT Governance Models

This research has been influenced by five commonly cited models (as illustrated in Table 4.1: A comparison between the selected five models). Tracing the evolution of IT Governance research and sharing the theoretical base is a vital step to establishing the boundaries and scope of IT Governance perspectives. Accordingly, the common visible IT Governance model is the three-tiered framework. In this model, IT Governance encapsulated structure, process and relational mechanisms, as shown in Figure 4.1: Three-Tiered IT Governance Framework and Figure 4.3: Complimentary and collaborative model of IT Governance.

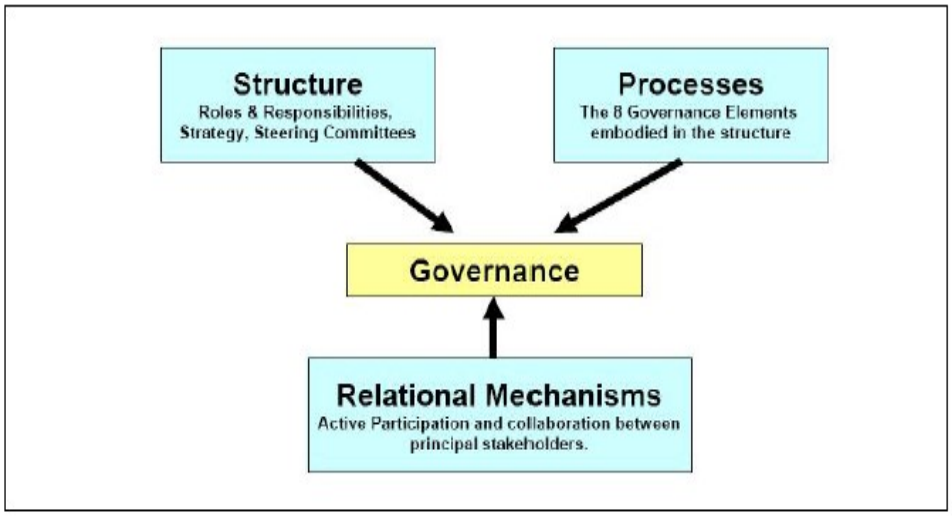


Figure 4. 2: Three-Tiered IT Governance Framework adopted from De Haes and Grembergen (2005)

De Haes and Grembergen (2005) highlighted that the three main blocks of IT Governance, as illustrated in Figure 4.1: Three-Tiered IT Governance Framework, stem from collective works of researchers and consist of structure, process and relational mechanisms (Peterson, 2000b, Peterson, 2004a, Weill and Woodham, 2002, Van Grembergen et al., 2004). Structures commonly refer to the high level governance strategy and include: roles and responsibilities, strategy and steering committees. The process dimension refers to the use of appropriate tools and monitoring techniques for the purpose of controlling the IT Governance framework. Finally, the relational mechanisms dimension is required for

internal and external relationship management. This model provides the important basic components of the IT Governance concept.

Grant et al. (2007) discussed the extended IT Governance model as shown in Figure 4.2: Extended IT Governance model. Their model is divided into four dimensions and the authors realized the dynamic nature and multi-dimensionality of IT Governance. Their extended model was based on both theoretical assumptions and empirical evidence across public and private organisations. The author's proposed eight core elements for the IT Governance process are namely; Direction Setting, Strategic Alignment, Performance Management, Risk Management, Control and Compliance, Relationship Management, Transformation Management and Value Management. In fact, IT Governance requires a set of processes to meet the business requirements and are aligned within IT policy documents. It is centric and linked to other elements.

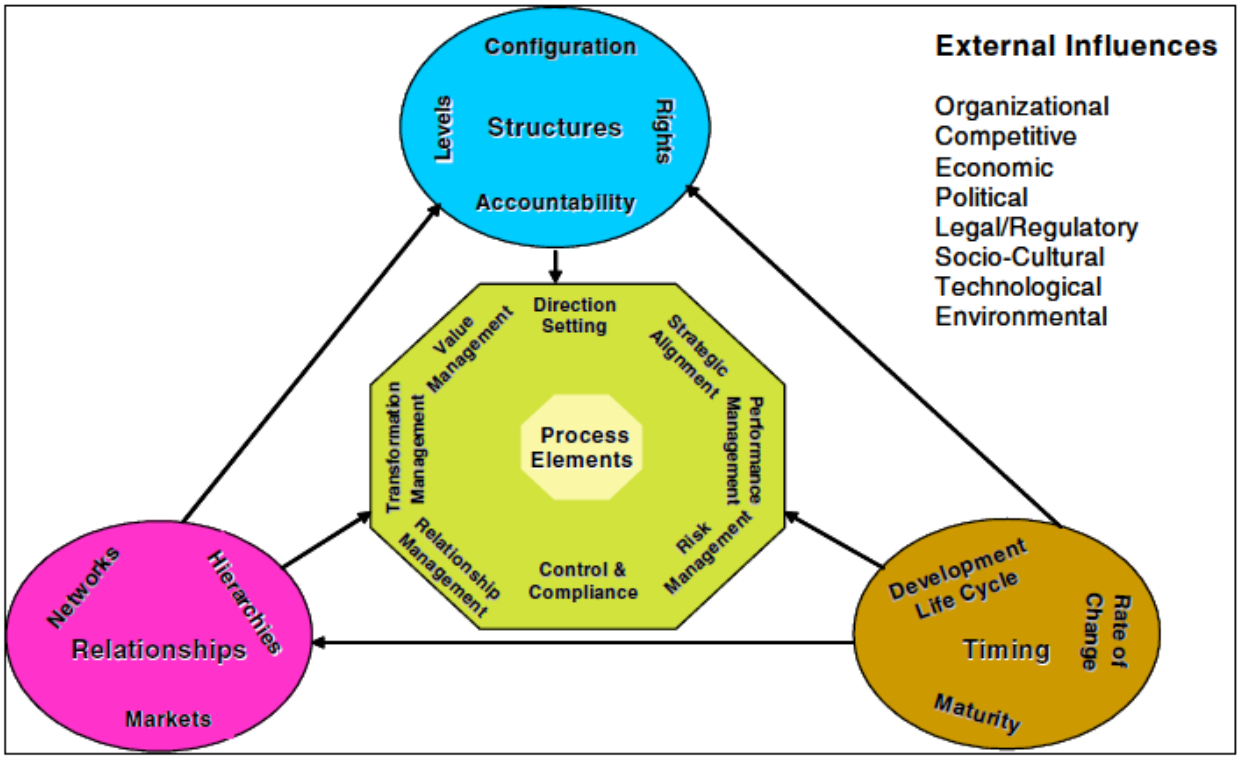


Figure 4. 3: Extended IT Governance model proposed by Grant, Brown et al. (2007)

The second insertion of Grant's study identified the relationship types. The authors argue that:

> "all IT Governance frameworks must include provision for mechanisms across three primary types of relationships"(Grant et al. 2007, p.6).

These relationship modes are network, hierarchy and market. The network relationship indicates formal relationships as peer relationships governed by service level agreement, or informal as in social networks. The hierarchical relationships are formal and involve the delegation of procedure in centralized authority. Finally, market relationship involves the IT stakeholders and buyer-supplier arrangements such as outsourcing arrangements. However, these relationship modes are explicitly practiced in the daily IT activity world and they affect the governance framework. The tiered insertion is known by the temporal dynamics of IT Governance. Three aspects must be considered, maturity, life cycle and rate of change. Here is an important influence that the researchers recognised as important to the maturity process and monitoring processes to ensure that current IT Governance remains aligned with the overall business objectives (Grant et al., 2007). The fourth insertion to the IT Governance model is the structure. The authors argued that at least four IT Governance structures must be considered namely, configuration, rights, accountabilities and levels. These are vital components because organisations depend on a variety of internal and external contingencies in decision making about IT as a reflection of varying levels of centralised or decentralised structures. Each particular type of decision making requires clear rights and responsibilities and therefore reflects the level of ownership for accountability structures.

In Figure 4.3: Complimentary and collaborative model of IT Governance, depicts the dimensions and sub-dimensions of IT Governance in a holistic view to understand the scope of the phenomena (Denise and Dieter, 2010). The authors provided a complementary and collaborative model to understand the IT Governance concept from both theory and practice. Then the identified current theory-practice gaps within the university sector are studied. They viewed IT Governance as structure-oriented, process-oriented and people-oriented and adopted this classification from Keyes-Pearce (2002). The structure dimension is further divided into two sub-dimensions: IT organisational structure and mechanisms. The

organisational structure is important because it reflects the relationships within the organisations and how they are deriving value from IT. The second dimension is process and considers the technical nature of IT activities as considered within COBIT for instance. Here the researchers mentioned and linked the use of tools and techniques to align IT with business and therefore performance tracking to sustain positive outcomes. The third dimension is people; the researchers encapsulated the human element and included leadership, roles and responsibilities, commitment and participation and finally awareness and understanding. These sub-dimensions are vital to IT Governance practice because organisational capacity refers to the human skills and capabilities required to support and shape the business (Henderson et al., 1996, Denise and Dieter, 2010). They acknowledged a number of research limitations. Firstly, the model could be further developed because the research model is theoretical and different reviewers of the literature could identify different or similar practices. Secondly, the authors pointed out to the possibility of replicating to a wider sample of organisations because the study was limited to four universities in Australia.

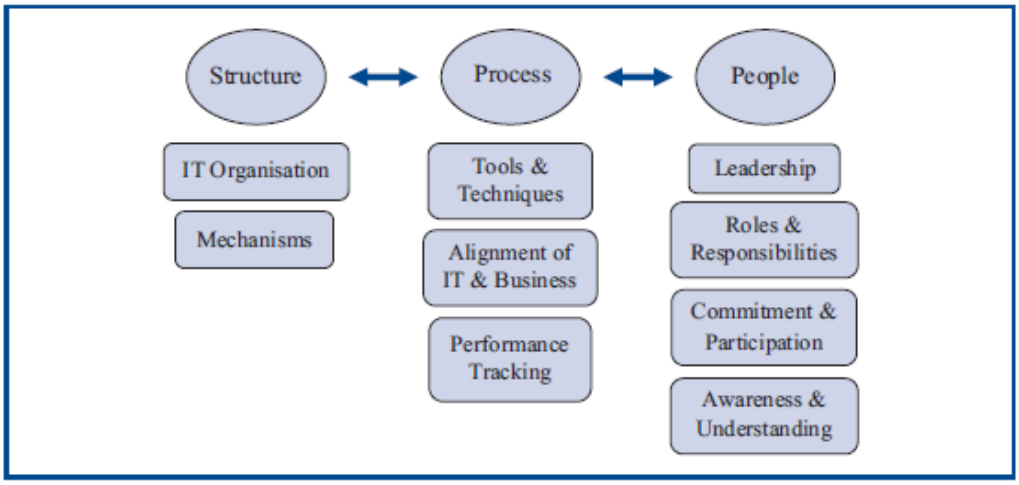


Figure 4. 4: Complimentary and collaborative model of IT Governance (Denise and Dieter, 2010)

Another study by Peppard and Ward (1999) explored the literature in the IS field to examine the role of IT in three IT organisations to provide the backdrop to their research. First they used a framework for diagnosing the gaps consisting of four dimensions: leadership, structure and processes, service quality and finally values and beliefs. During

the data collection stage, they discovered that the framework is incomplete and not helping in diagnosing the nature of gaps. They stated that there was a clear gap in IT performance in relation to role and functions of the IT organisation and the role of people. Therefore, they developed a framework based around the relationship derived from understanding both the business and IT management viewpoint; however the research did not attempt to define the nature and extent of the relationships between these dimensions. The five dimensions of this framework are: structures and processes, leadership, values and beliefs, roles, and service quality.

They also stated a clear message that achieving high performance from IT is an organisation-wide activity and requires a strong business/IT partnership. Figure 4.4 shows the revised framework for identifying the main elements needed to manage in relation to the IT/business gap. However, the study explicitly points out that they do not address the nature and extent of the relationships between them.

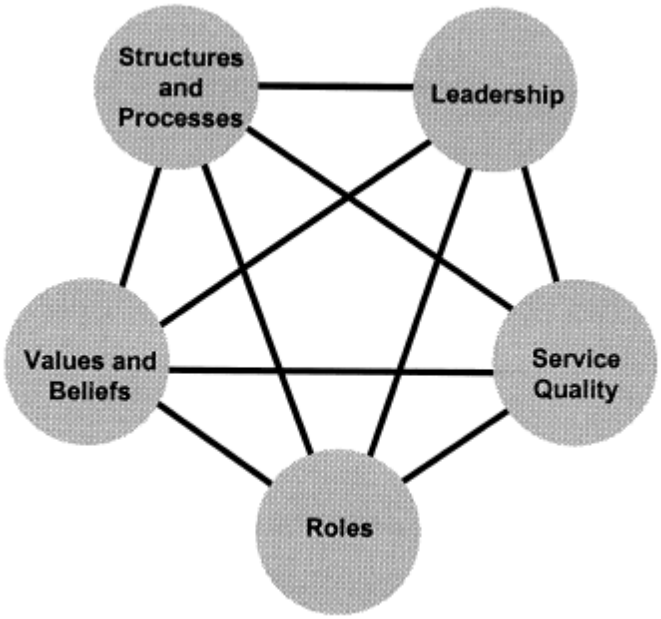


Figure 4. 5: A framework for managing the relationship between the IT organisations (Peppard, 1999)

In January 2009, the Information Systems Audit and Control Association (ISACA) introduced the Business Model for Information Security (BMIS) as an effective management approach to

overcome information security difficulties (ISACA, 2010). This model is illustrated in detail in the literature review chapter (Chapter Two); however, it is a major influence on replicating the pyramid shape with the four elements and how they interact through dynamic interconnections as shown in Figure 4.5: BMIS.

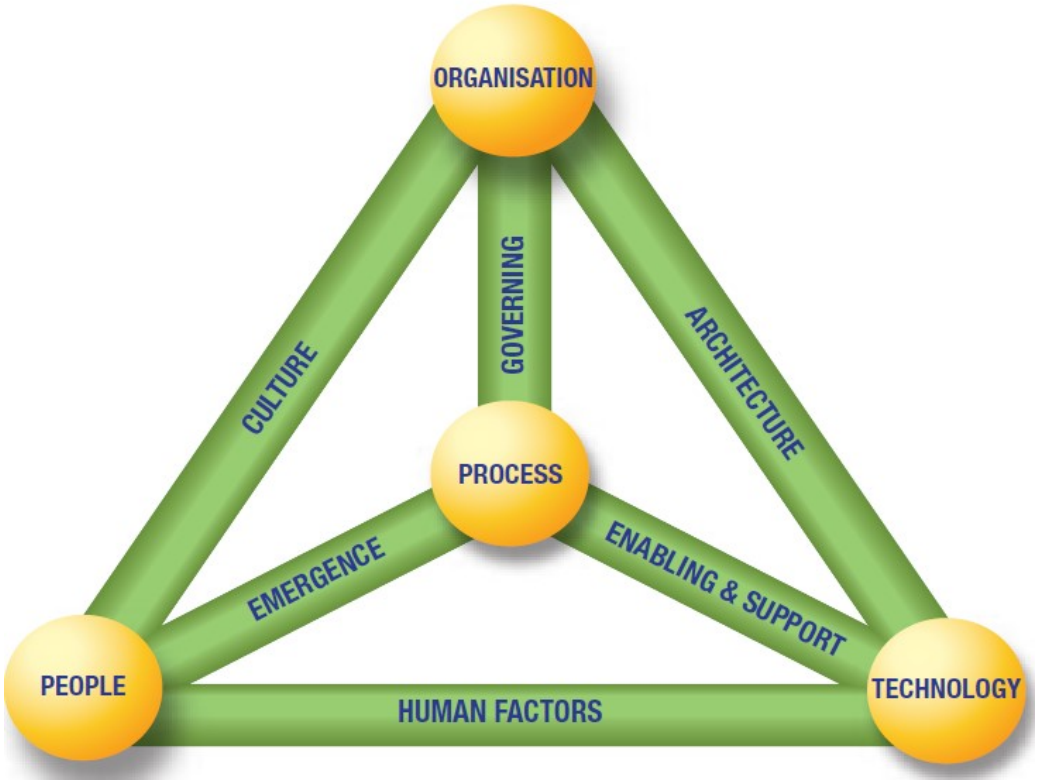


Figure 4. 6:BMIS model adopted from (ISACA, 2010)

The authors of the selected models and frameworks pointed to the necessity of investigating the nature of governance relationships and how they are enacted in practice because the dynamics of the environment shape governance arrangements and form their implementation in the real-world (Jacobson, 2009, Grant et al., 2007); for instance, the extended IT Governance model delineated to the dynamic nature of the IT Governance concept and the interconnections of several elements other than process, structure and relational mechanisms. However, the types of these interconnections are not included. The process element is central to this concept, yet this requires further investigation on its

relation to the other elements and what these elements would be. A summary is prepared and presented in Table 4.1: A comparison between the selected five models.

Number	Model	IT Governance Dimensions Or elements	Year	Citation	Remarks
1	Peppard	Structures and processes, leadership, service quality, roles, and values and believes.	(Peppard, 1999)	206	• Three private organizations based in the UK (manufacturing, financial, newspapers distribution). • Data collection was theoretical and used for both questionnaires and interviews. • Selection of sample was based on willingness to co-operate, availability and multiple sources of information. • Mentioned the relationship between the IT organization and the rest of the business.
2	The three-Tiered	Structure, process, relational mechanisms.	(De Haes and Grembergen, 2005)	182	• Cited in a Belgian financial organization (private sector). • Qualitative data collection by conducting face-to-face in-depth interviews. • Samples covered IT and business representatives. • Investigated the common elements of IT Governance framework and provided guidance on how IT Governance can be deployed in practice by using mix of structures, processes and relational mechanisms.
3	Grant Extended model	Structures, process element, timing, relationships.	(Grant et al., 2007)	14	• Based on existing research related to IT Governance and provided a more in-depth understanding of the concept. • The articulation shape of the model reelected that core elements of IT Governance are connected with process elements.

Number	Model	IT Governance Dimensions Or elements	Year	Citation	Remarks
4	Denise and Dieter	Structure, process, people.	(Denise and Dieter, 2010)	26	• Conducted a multiple case study in four universities based in Australia. • Used semi-structured interviews to reflect the theatrical research model and to ask in-depth questions about IT Governance practices. • Identified two large gaps between theory and practice: o Integrating various IT Governance mechanisms with the awareness and understanding of the concept. o The research can be replicated with a broader range of organisations. • Indicate a broad and holistic view of IT Governance concept with dimensions and sub-dimensions.
5	BMIS	Four elements (people, process, technology, organization) with six dynamic interconnections (culture, human factors, governing, architecture, enabling and support, emergence).	Introduced in 2009 (ISACA, 2010)	39	• The model is concerned with security programme in the organization. • Used the concept of system thinking indicating that a change at one end will cause changes in other parts. This understanding provides a better situation for decision-making. • The model can be adopted in any organization.

Table 4. 1: A comparison between the selected five models

4.4. Proposed Conceptual Model for IT Governance

Recall that the researcher mentioned the theoretical base of IT Governance in Chapter Two and reviewed the evolution of boundaries and scope of the IT Governance concept in the previous sections. In addition, it has been discussed in Chapter Three that the researcher adopted qualitative and quantitative research methodologies. Therefore, the researcher has proposed the SHIP-ITG Model as constructed from theoretical understanding and practice by means of the instrument used for assessing the maturity level of IT Governance in the selected five organisations (case study research will be illustrated in Chapter Five).

In this research, the instrument is the COBIT 4.1 assessment questionnaire used to survey the research sample in practice (this is similar to Peppard (1999) who used a framework for diagnosing the gap between the IT organisation and the rest of the business). This empirical stage considered an important practice for the researcher because of semi-structured interviews to collect answers for assessing the maturity of the organisations and provided an opportunity to use the researcher lens to observe and discuss "over and over again to see if the constructed, categories, explanation and interpretations make sense" as reported by Patton (1980, p.339).

This research study presents the SHIP-ITG Model as shown in Figure 4.6: SHIP-ITG Model**.** This model is the major contribution of this research and outlines IT Governance dimensions to clarify the boundaries and scope of the concept. The model contains four elements of IT Governance and six interconnected relations between them. The researcher stated that there is a correlation between the development research in IT Governance models, as presented in the previous section, and the relationships extracted from the literature review. These are then validated in practice through the researcher and participant lenses. The model situates IT Governance in a dynamic environment because IT Governance prospers by selecting any side of the elements to reach the entire model by means of the proposed interconnected links or relations to cope with the real-life IT environment. The model will now be deconstructed and the decisions and what informed these decisions will be presented.

The first letters from each of the four elements formed the name “SHIP-ITG Model” and are:

1. Strategic/ Organisational Objectives
2. Human Resources
3. IT Resources
4. Processes and Activities

The previous models and frameworks discussed in section 4.3, and illustrated in Table 4.1: A comparison between the selected five models, mentioned IT Governance as a holistic view with additional elements in the evolution theory, although they stressed the relations between those elements, as seen in Figure 4.1: Three-Tiered IT Governance Framework, Figure 4.2: Extended IT Governance model, Figure 4.3: Complimentary and collaborative model of IT Governance and Figure 4.4: A framework for managing the relationship between the IT organisation, without indicating the nature of the interconnections. However, the ISACA model informing this research study and illustrated in Figure 4.5: BMIS, mentioned the type of interconnections between its elements in relation to the specialized domain they covered in information security. The four elements proposed in the SHIP-ITG Model need to be integrated and work dynamically as three elements are linked to a single core element. Therefore, the model proposed six interconnections and these are:

1. Organisational Structure
2. Accountability
3. Relational Mechanisms
4. Value Delivery
5. Monitoring
6. Performance Management

Figure 4. 7: SHIP-ITG Model

4.4.1 Four elements

In section 4.3, the researcher discussed the previous models and then proposed the IT Governance "dimensions" as this acronym was used in the work of Denise and Dieter (2010) , Grant et al. (2007) and Peppard (1999) and is similar to the acronym "elements" as used by ISACA (2010) and used again in the core process element in the model of Grant et al. (2007). Both acronyms are used to describe the scope of the IT Governance concept. IT Governance elements or dimensions have been repeatedly mentioned in previous models, such as: process, structure, relational mechanisms, people, leadership, service quality, roles, values, maturity and accountability. In addition, it has been mentioned in Chapter Two that in ITGI (2003) focus areas are

defined as: IT strategic alignment, value delivery, risk management, resource management and performance management. Therefore, the researcher studied and considered both routes to construct the proposed model. The proposed SHIP-ITG Model introduced four elements as follows:

- The **Strategic/Organisation Objectives** element can be viewed from the organisational level of IT Governance practices. In this element, a dedicated IT strategy committee should formulate IT strategy considering the investment in IT is in harmony with the organisations' objectives and goals. This is also introduced as "IT Strategic Alignment" by the ITGI (2003). There are a number of considerable points informing this research and included within Strategic Organisation Objectives as follows:
  1) Business objectives and the competitive environment.
  2) Current and future technologies and the costs, risks and benefits they can bring to the business.
  3) The capability of the IT technology to deliver current and future levels of service to the business, and the extent of change and investment this might carry to the whole organisation.
  4) Costs of the current IT and whether this provides sufficient value to the business.
  5) Consider the lessons learned from the past failures and successes.
  6) Regularly review the strategy in light of technological and operational change.

- The **IT Resources element** is the IT assets that can be procured, such as applications, information and infrastructure. These IT assets need to be used wisely and responsibly to ensure the optimal benefit in IT investments by providing the appropriate methods and skills to manage IT projects at the IT Director level and with a dedicated IT steering committee.

  IT Resources are considered the backbone of the organisation as reported by Prasad et al.(2012). According to ITGI, IT Resources are identified in COBIT as

application, information, infrastructure and people (ITGI, 2007). Another research study introduced five dimensions for managing the relationship between the IT organisation and the rest of the business, as shown in Figure 4.4: A framework for managing the relationship between the IT organisation (Peppard, 1999). However, the proposed IT Governance model in this research (Figure 4.6: SHIP-ITG Model) shows Human Resources element as a separate factor because Human Resources are IT assets that cannot be procured. This perspective has been informed by the COBIT 4.1 framework used in this research study because the ITGI introduced and separated IT Resources as in process AI5: Procure IT Resources within Acquire and Implement domain, and PO7: Manage it Human resource within Plan and Organise domain. Both require strategic tactics to identify and implement and irrigated from the organisational objectives (ITGI, 2007).

The IT Resource element is connected within three elements (strategic/organisational objectives, process, human resources) and three different interconnections. These are illustrated in the next paragraphs.

- The **Human Resources** element indicates IT personnel (employees) working in an IT Directorate and other stakeholders. In the Human Resource Management (HRM) domain, employees are resources of the employer and considered as human capital. HRM describes human capital in terms of "their training, experience, judgment, intelligence, relationships and insight the employee characteristics that can add economic values to the organisation" (Noe et al., 2006, p.37). Therefore, HRM contributes to an organisation's performance such as quality, profitability and customer satisfaction. It has been also stressed that HRM practices should support the organisation's business strategy. To cope with the HRM domain, this human resource element requires defining the size of the employees with the specific knowledge and skills needed (human resource planning), recruiting employees, selecting employees, training employees on how to perform their jobs and preparing them for the future as part of the development

plan, evaluating their performance, introducing the rewarding policy (compensation) and finally, creating a positive working environment.

In spite of the importance of this element, the term used implicitly in the literature review has attracted less attention (Denise and Dieter, 2010). According to Denise and Dieter (2010) referring to the IT Governance institute (ITGI, 2003), IT Governance requires leadership to ensure that IT activity is sustained and extended to achieve the organisation's goals. Further, (Grembergen, 2004b) stated as part of IT Governance definition that it is the organisational capacity exercised by the board, executive management and IT management. Organisational capacity refers to human capabilities and skills required to shape the business as stated in Denise and Dieter (2010). Another emphasis found in the literature is the importance of clear roles and responsibilities applied by the board of directors and the involved parties (Grembergen, 2004a, Denise and Dieter, 2010). Thus, Weill and Ross stressed that organisations require rethinking their governance structure and individuals must re-learn the assigned roles (Ross et al., 2004).

The Human Resource element is bound to IT Resources, process and strategic elements with three interconnections (value delivery, performance management and relational mechanisms).

- The **Process or Activities** element was imitated in a number of previous models as illustrated in section 4.3. It has been mentioned in the basic model of IT Governance and then was developed as a core element in the models proposed by Grant et al. (2007), Denise and Dieter (2010) and ISACA (2009). The process element can be viewed differently to IT resources and human resource elements because both require distinct capabilities and skills for procuring and managing. Therefore, process indicates a set of responsibilities and actions introduced and documented in the IT Policy document to enable employees to manage these IT

related operations. It is important to note that processes must be aligned and meet with the organisational requirement (ISACA, 2010, ISACA, 2009).

From another author's viewpoint, process can be defined in terms of IT infrastructure, such as system development and operations (Jerry, 1996). Further, researchers have moved to understand the process-based phenomenon and defined IT Governance as a collection of integrated forces designed to control and monitor IT resources while maintaining alignment with business objectives (Grant et al., 2007). The underlying belief of this view recognizes that IT Governance is based on decision making and extends to reach all parts of the organisation.

The process element is located in the centre of the model and bound by three interconnections explicitly; monitoring, organisational structures and performance management. These three interconnections are linked to three other elements. Monitoring requires technical measures such as IT downtime, risk and access failure, while the performance management and organisational structure requires evaluating business-related measures, such as customer satisfaction and ability to innovate. This view is supported in the literature by Van Grembergen and De Haes (2005) suggesting organisations need to find a good balance between output and performance by including business measures and technical measures.

4.4.2 Six relational links

The previous models introduced in section 4.3 stressed the links and the existence of relations between the proposed IT Governance elements. In fact, the ISACA (2009) model mentioned six interconnections to overcome information security difficulties: architecture, governing, enabling and support, human factors, emergence and finally culture. However, these terms are not considered within the SHIP-ITG Model. The proposed SHIP-ITG Model introduced four elements, as illustrated in the previous paragraphs, and linked to each other in a relational link referred to as "interconnections". These six interconnections are defined as follows:

- **Organisational Structure** illustrates the hierarchical arrangement of how authority, communication, rights and duties exist in an organisation. This interconnection is between the strategic organisational objectives and process elements (as shown in Figure 4.6: SHIP-ITG Model). The key issue in this part is that decision making is considered crucial in IT Governance practice because IT Governance is situated at multiple layers in the organisation such as at strategic level where the board is involved, at management level and finally at operational level.

  Studies have indicated that organisational structure plays a significant role in IT Governance (Grembergen, 2004b, Denise and Dieter, 2010, Grant et al., 2007). This is related to the location of the IT decision-making authority. It presents three basic forms of IT organisational structure: centralized, decentralized and federal. According to the studies, a feudal structure (a hybrid design of centralized infrastructure and decentralized application control) is the dominant structure (Grembergen, 2004b). However, another study states that IT Directors/CIOs prefer the centralized mode because the decentralized structure was seen as high risk as it weakened control over IT (Denise and Dieter, 2010). Further evidence emanating from the literature is expressed in Table 4.2: Organisational Structure interconnection evidence from the literature review.

Factor	Reference	Description
Organisational Structure	(ITGI, 2003)	The responsibility of the board of directors and executive management, where it is an integral part of enterprise governance and consists of the leadership and organisational structures and processes that ensure the organisation's IT sustains and extends the organisation's strategy and objectives.
	(DeCanio et al., 2000)	Organisational structures affect the behavior of firms through at least two channels. First, structure can have an effect on company-wide measures of performance, such as profitability, etc. Second, the structure of the firm can have consequences for the individuals or operational units that comprise the organisation.
	(Grant et al., 2007)	The governance structure details how many committee levels or layers there are and outlines each of their primary roles.
	(Ross and Weill, 2004c)	Structure consists of organisational units, roles, and responsibilities for making IT decisions between management and IT committee cooperation.

Table 4. 2: Organisational Structure interconnection evidence from literature review

The empirical practice in this research translates the importance of decision making embedded in IT processes. These is starting from a high layer in the organisations; such as strategic IT plan and technology direction, to IT management level; such as managing projects, and finally to operational level where technical people are involved, in the case of Assess and Manage IT Risks and Procure IT Resources. In fact, most IT decisions require shared teams across the organisation for effective and optimal decision-making. Therefore, the strategic organisational objectives element is bound by the IT processes element through the interconnection link known as organisational structure.

- **Accountability** is the acknowledgment of responsibility and implementation of policies within the scope of an employment role and position encompassing the obligation to report or explain any resulting consequences. This interconnection is between strategic organisational objectives and IT resource elements (as shown in Figure 4.6: SHIP-ITG Model) because accountability ensures that IT strategies are defined in a way that maintains IT resources and verifies that these resources are used responsibly. According to ITGI's definition of the IT Governance focus area (ITGI, 2007), Resource Management is one element and relates to the optimal investment in and proper management of critical IT Resources.

  Table 4.3: Accountability interconnection evidence from literature review indicates that the accountability relationship remains a vital part of the IT Governance model and is considered a rich reference in the literature investigated. The accountability relation has a connection with the structure of the organisation, which simply supports the organisational strategy and always has an impact on human resources. This is a crucial role for IT Governance to communicate and delegate responsibilities for determining how decisions are made (Nfuka, 2012, Peterson, 2004a, ITGI, 2007). The structure of the organisation differs for many circumstances, such as type of organisation, size, culture and geographical location (Dahlberg and Kivijarvi, 2006).

Factor	Reference	Description
Accountability	Jerry, N. Luftman(1996)	"The art of business process design lies in knowing the correct balance between accountability and procedure that is appropriate for a given process" and continues that "In general, the amount of accountability that should be designed into a given process increases with the amount of adaptability required".
	Weill, P. and J. W.Ross(2004)	Specifying the decision rights and accountability framework to encourage desirable behaviour in using IT.
	Willson, P. and C. Pollard(2009) Jaafar, N.I. and E. Jordan (2011)	The authors point out that accountability and control is one of the six facets of IT Governance that is commonly associated with corporate governance or strategic information system planning (SISP) in organisations.
	Denise Ko, D.F.(2010) ITGI(2007) Bowen, P.L., M.-Y.D. Cheung, and F.H. Rohde(2007)	Recall that IT governance encompasses dimensions; accordingly, accountability is driven into the organisation by embedding into the IT governance process, i.e., establishing the policies and procedures used to implement the IT investment projects.
	(Weill, 2004a, Webb et al., 2006)	Accountability within the processes is essential and learning from one implementation to another, through iterative modifications in the processes must occur to ensure more adept sharing and reuse of IT assets.
	(Grembergen, 2004b)	IT Governance is concerned with two things: that IT delivers value to the business and that IT risks are mitigated. The first is driven by strategic alignment of IT with the business. The second is driven by embedding accountability into the enterprise.
	(Peterson, 2004b)	IT Governance architecture is defined as the manner in which responsibilities and accountabilities for the IT portfolio are organized and integrated, and describes the differentiation and integration of strategic decision-making for IT.

Factor	Reference	Description
	(Webb, 2006)	At least 50 countries have corporate-governance regulatory frameworks in place to encourage and in many cases require accountability of companies to their members and communities to work efficiently and effectively to achieve the goals and objectives.
	(Keasey and Wright, 1993)	Accountability, which is a sub-set of governance, involves the monitoring, evaluation and control of organisational agents to ensure that they behave in the interests of stakeholders and other stakeholders.

Table 4. 3: Accountability interconnection evidence from literature review

In this research study, the dynamic nature of the proposed SHIP-ITG Model allows for focusing beyond the relation between the strategic element and IT Resource elements because the elements are further bound and integrated to other elements by interconnections. Thus, the model simplifies the understanding of the IT Governance concept and the relations of how to implement them.

- **Monitoring or evaluation** ensures that processes are running and managed without any associated risks or unexpected costs linked to IT resources. Therefore, this interconnection is between IT resources and process elements (as shown in Figure 4.6: SHIP-ITG Model). In this review, suggestions for any process activity amendments can be initiated with the related IT resources (applications, information and infrastructure). For example, allocating policies for taking decisions related to an information security breach differs from failure to deliver a device to the correct destination.

In Table 4. 4: Monitoring and evaluation interconnection evidence from literature review, show that the literature explored the importance of “monitoring” and its relation to decision-making, performance, value delivery, SLA’s and strategies

(Mohamed and Singh, 2012). According to "A conceptual framework for Information Technology Governance effectiveness in private organisations" monitoring requires regulatory bodies to address the specific objectives including the IT control structure, protection of IT investment, security and protection of information and quality of IT services.

Factor	Reference	Description
Monitoring or evaluation	(Lapão, 2011)	Decision making could be more effective with COBIT since it aids management in defining a strategic IT plan, defining the information architecture, acquiring the necessary IT hardware and software to execute an IT strategy, ensuring continuous service, and monitoring the performance of the IT system.
	(Schmidt and Brauer, 2006)	By continuously monitoring whether managers comply with agreed upon strategies or diverge from them, the board guarantees its share- and stakeholders that the corporation really "walks like it talks" or "aligns words and deeds.
	(Simonsson and Ekstedt, 2006)	The literature highlights the importance of monitoring decision-making at all times. Even though practitioners struggle with understanding, literature, acting in an idealized world, stresses the importance of monitoring to excel in long-term IT value delivery to the business.
	(Grembergen, 2004b)	The SLM process includes the definition of an SLA framework, establishing SLAs including levels of service and their corresponding metrics, monitoring and reporting on the achieved services and problems encountered, reviewing SLAs, and establishing improvement programs.

Table 4. 5: Monitoring and evaluation interconnection evidence from literature review

From a thorough investigation into COBIT 4.1(ITGI, 2007), the IT Governance Institute shows that Monitor and Evaluate is one of the Four domains of COBIT with

associating processes employed by the IT organisation. Besides, it delivers the final statement to "provide IT governance". The maturity model introduced in Chapter Two also stressed the monitoring instrument starting from the initial maturity level. This will be further discussed in Chapter Six of this research study.

- **Value Delivery** focuses on three aspects: on-time, within-budget and quality. This interconnection is an important relation between IT resources and human resources to optimize expenses and provide the value of IT (Buchwald et al., 2014). IT is critical to the organisation's success. It influences nearly every aspect of the organisation's activities. For some organisation IT enables productivity growth, for others it changes their business models and provides opportunities to obtain a competitive advantage. At the same time different research has shown that effectiveness of IT investments is very low (Brynjolfsson and Yang, 1996). There is a huge need to implement a systematic approach to IT management in enterprises which will lead to maximizing the value of the organisation (as mentioned in Table 4. 5: Value delivery interconnection evidence from literature review). The answer to this challenge is the concept of IT Governance. The role of IT governance is to integrate good practices, providing IT with support for realizing the organisation's objectives. It gives the organisation the possibility to use information it possesses in the largest scope and maximize the benefits coming from it, leading to gaining a competitive advantage and building the organisation's value. Organisations that have adapted advanced solutions for IT Governance have 20% higher profitability than companies from the same sector with similar strategies that have poor IT Governance (Artur, 2009). Value delivery is an important component in the five IT Governance focus areas as pointed out by the ITGI in the 2nd edition of the Board Briefing on IT Governance and COBIT 4.1 (ITGI, 2003, ITGI, 2007).

Factor	Author	Statement
Value delivery	(Webb et al., 2006)	All aspects of the framework are reflected by the analysis of the definitions, although some elements have received greater attention (strategic alignment, delivery of business value, policy and procedures) than others (performance management, risk management, control and accountability).
	(Hardy, 2006)	IT governance pinpoints attention on two key issues –the value IT delivers to an organisation, and the control and mitigation of IT-related risks. Mitigating IT risks and achieving IT value require a new brand of partnership among IT, business units, boards and executive management. Companies need a strong governance model in place to approve, prioritize and manage IT investments on an ongoing basis. This is necessary to align IT investments with the business requirements needed to deliver IT value to the company.
	(Buchwald et al., 2014)	Structures, processes, and procedures are not only available, but actively support the transformation of the IT organisation toward the new strategic objectives. ITG provides a reference framework that can be leveraged for IT governance success and its impact on business value, for instance in case of mergers or acquisitions.

Table 4. 6: Value delivery interconnection evidence from literature review

Several elements are important for public sector organisations in relation to business values. This is about the customer satisfaction, customer waiting time and employee productivity. Therefore, the successful value delivery is met when IT is aligned and supports the business within the appropriate functionality intended. The intended functionality needs to be agreed upon at the strategic level of the organisation along with considering the capacity to deliver this value.

- **Performance Management** is measuring the expenditure of human resources on information technology projects and monitoring IT services. This interconnection

is between process and human resource elements (as shown in Figure 4.6: SHIP-ITG Model).

Previous research has investigated the use of tools to manage IT resources, such as the balanced scorecard (BSC) to assess the value of IT as mentioned in Grembergen (2004b). The aim of these evaluations was the financial benefits or the ROI (Return on investment). On the other hand, COBIT provided 34 IT processes consistent within four domains and each included their corresponding control objectives, management guidelines and maturity model (ITGI, 2007). In addition, monitoring performance is needed to make sure that the right things are done in accordance with the right directions and policies as mentioned in process ME1: monitor and evaluate (illustrated in Chapter Six) (ITGI, 2007).

Factor	Author	Statement
Performance management	(Simonsson et al., 2010, p.14)	IT governance performance is the quality of the services that the IT organisation delivers, as seen from a business point of view.
	(Peppard, 1999, p.29)	The clear message from this article is that achieving high performance from IT is not just about the IT function's ability to build, maintain and deliver systems, but is an organisational wide activity requiring a strong business/IT partnership.
	(Dvorak et al., 1997, p.166 & p.176)	The research shows that what distinguishes these companies is not technological wizardry, but the way they handle their IT activities. Even IT-smart companies must be vigilant to keep pace with rapidly changing technologies. But the IT challenge facing companies today is primarily managerial; technology alone cannot materially affect performance.

Table 4. 7: Performance management interconnection evidence from literature review

In Table 4.6: Performance management interconnection evidence from literature review, it has been mentioned that IT Governance performance is related to quality

of services (Simonsson et al., 2010), and requires strong business/IT partnership (Peppard, 1999) as technology alone cannot solve IT challenges (Dvorak et al., 1997). This interconnection link can be considered as embedding accountability in the model (Grembergen, 2004b) as performance management and risk management are connected to IT, delivering value to the business and mitigating IT risks. These are translated in the proposed SHIP-ITG model to ensure the public organisations use the appropriate tools for measuring the performance of IT activities because of the embedded nature of IT Governance capabilities (capability maturity models illustrated in Chapter Two and Chapter Six).

- **Relational Mechanisms** stands for the communication and the channels between strategic and human resource elements. This includes policies and procedures to assist and support the operation of IT Governance, with a dedicated IT Strategy committee, and involves educational efforts for disseminating IT Governance principles, such as by training and knowledge transfer management plans.

  The relational mechanisms manage the soft side of IT Governance (Mohamed and Singh, 2012). Webb (2006), for example, argues that policies and procedures are not evidence of IT Governance, however these are artificially created devices that support the operation of IT Governance and do not define it. Similarly, (Lainhart Iv, 2000) suggested that concerns with IT Governance focus primarily on policies and procedures that define how organisations direct and control the use of technology and protect its information from IT risks.

Factor	Author	Statement
Relational mechanisms	(Grembergen, 2003)	The relational mechanisms include business/IT participation and partnerships, strategic dialogue and shared learning.
	(Grembergen, 2004a)	The relational mechanisms include business/IT participation, strategic dialogue, shared learning and proper communication. So, to reach effective IT governance, two-way communication and a good participation/collaboration relationship between the business and IT people are needed. Ensuring ongoing knowledge sharing across departments and organisations is paramount for attaining and sustaining business/IT alignment. It is crucial to facilitate the sharing and the management of knowledge by using mechanisms such as career crossover (IT staff working in the business units and business people working in IT), continuous education, cross-training, etc.

Table 4. 8: Relational mechanisms interconnection evidence from literature review

In (Peterson, 2000a) an important investigation within the IT Governance domain refers to relational mechanisms as "the active participation and collaborative relationships among corporate leaders, IT managers and business managers". This includes leadership and decision-making capabilities practiced within the two emblements. Thus, in this model, relational mechanisms bond between the organisational strategy and human resource elements. More evidence from literature is available in Table 4.6: Relational mechanisms interconnection evidence from literature review

4.5. The SHIP-ITG Maturity Criteria

The summary of the maturity assessment of SHIP-ITG Model in Figure 4.5, illustrates five levels of governance maturity:

1. Level 1: Initial IT Governance stage.
2. Level 2: Committed IT Governance stage.
3. Level 3: Established IT Governance stage.
4. Level 4: Managed IT Governance stage.
5. Level 5: Optimized IT Governance stage.

Each of the five levels in turn focuses on four criteria based on the theory to practice IT Governance, as proposed in Figure 4.7: SHIP-ITG Maturity Criteria, and each is demonstrating attributes connected to the integrated and shared elements of the SHIP-ITG Model; these four criteria are:

1. Strategic/Organisational Objectives Maturity.
2. Human Resources Maturity.
3. IT Resources Maturity.
4. Process Maturity.

The procedure for assessing the IT Governance Maturity is as follows:

1. A formal ITG Steering committee must be initiated for IT decision making with the organisational level partnership allowing business managers and operational/ functional peers to interact in personal meetings.
2. Each criterion is assessed individually by a dedicated team of IT and business units to determine the organisation's IT Governance level.
3. The dedicated teams must discuss and understand the current state of the organisation's maturity and how best to proceed to improve this maturity.
4. After assessing each of the four criterions, an overall level must be delivered of the assessed maturity for the organisation committee. The next higher maturity will be a road map to identify what they should do next.

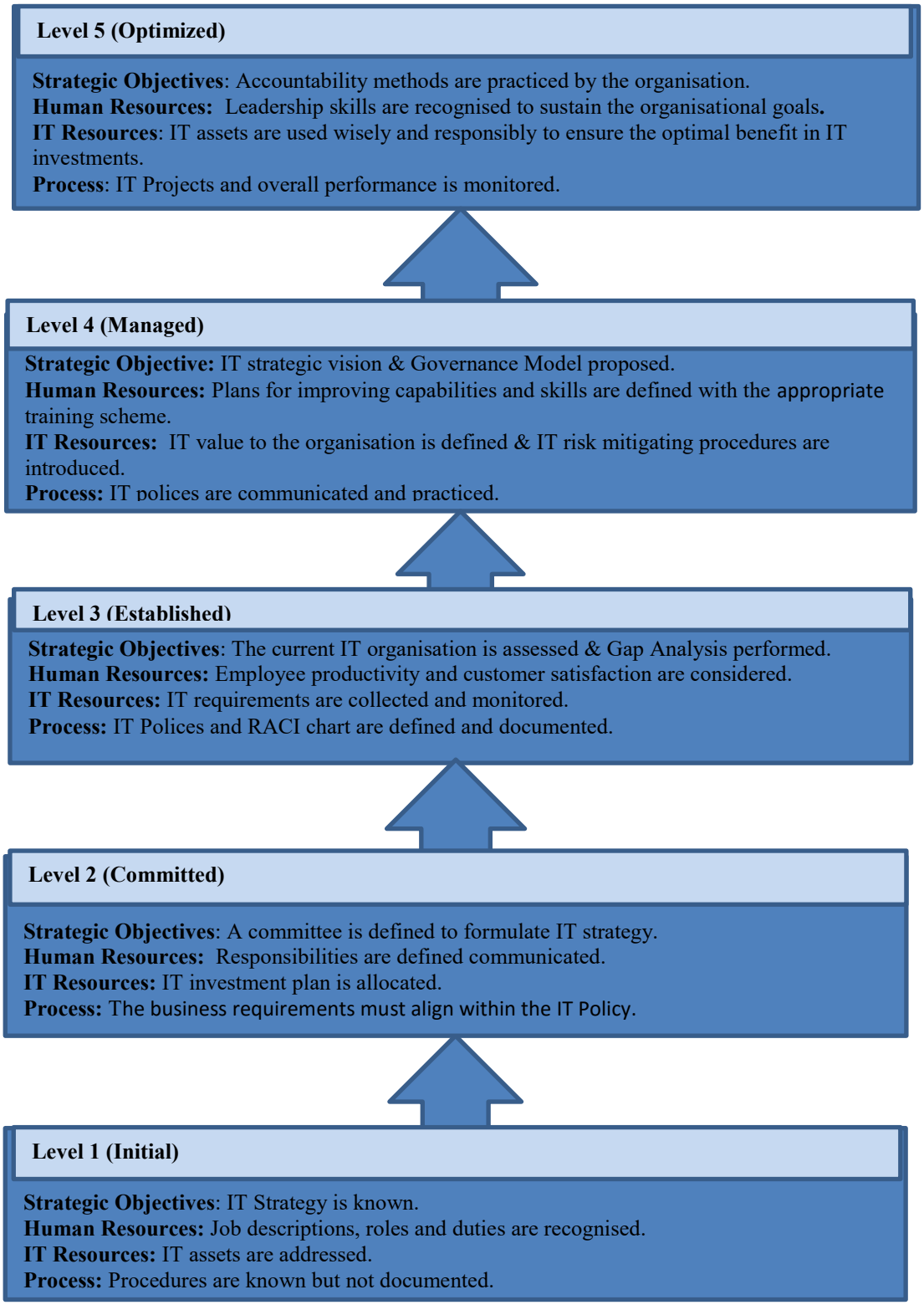


Figure 4. 8: SHIP-ITG Maturity Criteria

4.6. Calculating the overall maturity result

As described in Figure 4.7: SHIP-ITG Maturity Criteria, each maturity level is composed of four parts that require answers. These answers could be either (Completely, Quite a lot, Not at all or A little). A sample of the SHIP-ITG assessment table is shown in Table 4.9: SHIP-ITG agreement criteria table. The selected answers are mapped to numeric values for calculating the overall maturity level as shown in Table 4.8: Agreement with statements in numerical values.

Agreement with statement	Value
Not at all	0
A little	0.33
Quite a lot	0.66
Completely	1

Figure 4. 9: Agreement with statements in numerical values

The researcher adopted an algorithm for calculating the maturity level (Pederiva, 2003). This algorithm is illustrated in detail in Chapter Six. The SHIP-ITG Model with the criteria and the assessment table (as in Figure 4. 10: SHIP-ITG agreement criteria table) validation test result for MoE case study is illustrated in Appendix D.

Level	Maturity Criteria	Agreement with statement			
		Not at all	A little	Quite a lot	Completely
1	**Strategic Objectives**: IT Strategy is known.				
	Human Resources: Job descriptions, roles and duties are recognised.				
	IT Resources: IT assets are addressed.				
	Process: Procedures are known but not documented				
2	**Strategic Objectives**: A committee is defined to formulate IT strategy.				
	Human Resources: Responsibilities are defined communicated.				
	IT Resources: IT investment plan is allocated.				
	Process: The business requirements must align within the IT Policy.				
3	**Strategic Objectives**: The current IT organisation is assessed & Gap Analysis performed.				
	Human Resources: Employees productivity and customer satisfactions are considered.				
	IT Resources: IT requirements are collected and monitored.				
	Process: IT Polices and RACI chart are defined and documented.				
4	**Strategic Objective:** IT strategic vision & Governance Model proposed.				
	Human Resources: Plans for improving capabilities and skills are defined with the appropriate trainings scheme.				
	IT Resources: IT value to the organisation is defined & IT risk mitigating procedures are introduced.				
	Process: IT polices are communicated and practiced.				
5	**Strategic Objectives**: Accountability methods are practiced by the organisation.				
	Human Resources: Leadership skills are recognised to sustain the organisational goals**.**				
	IT Resources: IT assets are used wisely and responsibly to ensure the optimal benefit in IT investments.				
	Process: IT Projects and overall performance is monitored.				

Figure 4. 11: SHIP-ITG agreement criteria table

4.7. Conclusions

The importance of IT to any business still carries risks that need to be mitigated. In order to sustain the benefits of IT, organisations need a governance model to understand the concept of IT Governance. This discipline is differing from management in the way that it needs more controlling and directing. IT governance refers to formal high level processes and structures for IT strategic planning, prioritization, decision making and performance measurement. By having these formal processes and structures – such as IT strategy and steering groups – the organisation can better:

- Align IT strategy with the business strategy
- Transform high level strategic goals into actual IT projects.
- Establish procedures for prioritizing IT projects that are understood and supported by all senior managers.

This research study considered the five IT Governance focus areas: strategic alignment, value delivery, performance management, resources management and risk management (illustrated in Chapter Two). Therefore, some common acronyms have been adopted and linked to shape the SHIP-ITG model and lead organisations to understand this concept in a simple and realistic manner. The previous IT Governance models, reviewed in Section 4.3, explained the common elements of IT Governance concepts, however they lack the links and methods needed for implementing these concepts. They do not give an answer to how IT Governance can be achieved. Most studies in the field of IT Governance focused on presenting the elements in static view models. However, this study contributes to the existing IS domain by presenting a dynamic, interdependent and holistic model for implementing an IT Governance framework in any organisation. The model defined human resources, IT resources and the strategic objectives as three elements integrated by a fourth element defined as process and explored the interconnections between them. This is a contribution because the SHIP-ITG Model introduced a number of additions to the existing models. Firstly, the SHIP-ITG Model defined the strategic/organisational objectives element because the IT Governance starts at the

strategic level in the organisation. Secondly, the SHIP-ITG model separated the human resources element from IT resources element and considered the IT personnel as the human capital of the organisation. Therefore, the model defines IT resources as limited to applications, information and infrastructure. Thirdly, the model introduced value delivery interconnection between IT resources and human resources as value delivery is one of the IT Governance focus areas. Then, the model introduced the accountability interconnection between the strategic element and IT resources element in addition to the performance management and monitoring interconnections for embedding accountability. The researcher justified these vital parts in the SHIP-ITG Model. The evaluation criteria of the SHIP-ITG Model starts at level 1, therefore indicating that most organisations are explicitly mature.

Therefore, the findings from this research suggest that IT Governance requires flexibility and fluidity as seen in the proposed model and not strict adherence to predetermined responsibilities and procedures, however commendable (Chan, 2002). The pyramid-shaped model has been informed by the Business Model for Information Security as the initial investigation into IT Governance frameworks. The understanding of the IT Governance concept is important because it establishes the boundary and the scope of IT Governance processes.

Chapter 5

Case Study Research

In Chapter Three, the research methodology was presented and the adoption of a case study strategy discussed. This chapter describes the detail of adopting the case study research. In doing so, this chapter revises the unit of analysis and case selection and the empirical protocol adopted. Then, the chapter reviews each case study and the employees contributing to the study. The next chapter (Chapter Six) will describe data analysis and results.

5.1. Introduction

During Chapter Three, the researcher justified the adoption of case study research and found that it is a common strategy between most academics and researchers seeking to explore a phenomenon in a real-life context, especially when the boundaries between phenomenon and context are not evident (Yin, 2009). Therefore, the researcher found an opportunity to investigate and assess the maturity of the IT Governance phenomenon. This also provided multiple sources of evidence when trying to fine convergence among multiple case studies (five case studies) in a triangulating fashion.

At the beginning of the Chapter Three, the researcher justified the unit of analysis and case selection criteria. The research focuses on five public sector organisations and particularly concerns Information Technology (IT) or Information System (IS) Directors. For increasing the reliability of case study research, the researcher describes the case study protocol to guide the data collection (as general rules to be followed) from multiple case studies (Yin, 2009) as will be described in section 5.3: case study protocol. In section 5.5, the researcher provides an overview on each case study and also includes which employees contributed to the study.

5.2. Unit of analysis and domain selection

Prior to selecting research sites, it is essential for case study research to determine the most appropriate unit of analysis, such as the study focusing on individuals, groups, or an entire organisation (Benbasat et al., 1987). In adopting Benbasat et al. (1987) selection approach in this study, the research questions have to been considered, that is , to seek to identify the maturity level of IT Governance Practice in the Public Sector, therefore IT Directorates are the main focus in each organisation for this study. Consequently, results obtained from each organisation can be compared and generalized to other organisations.

It has been also stated in the previous chapter that this study is exploratory research, thus the decision of adopting multiple case study design was approached to investigate IT Governance

in practice and in a natural setting, which for this study is in the Kingdom of Bahrain. Therefore, the decision of research domain selection begins with considering the nature of the research topic; for instance IT Governance Practice in the Public Sector focuses on IT Directorate and its relation at the organisational level. The study has focused on selecting multiple case studies from the Public Sector with specific characteristics. Researchers conducting research in specific technologies, IS methodologies or organisational structures should consider a set of characteristics when selecting sites as pointed out by Benbasat et al. (1987). In his view, research on organisation-level phenomena would require site selection based on the characteristics of firms and may include the industry, company size, organisational structure, profit/not-for-profit status, public or private ownership (Benbasat et al., 1987).

This research approached large size organisations in public and governmental sectors that share similar IT organisational structure, provide in-house development efforts for building and improving systems, particularly, having good contacts and communications for the data collection. In fact, the public sector organisations selected have a good reputation in communicating and providing eServices (electronic services) as found in the opinion polls through the egovernment portal offered for their importance in leveraging the quality of eServices (Bahrain, 2015a). This is important because the public sector organisations are accountable for responding in an effective manner to citizen needs and, therefore, data is more readily available.

5.3. Case Study Protocol

The case study protocol contains, but is more than, the research instrument. It is defined as a set of procedures or general rules to be followed and is essential in multiple case study research (Yin, 2009). Using case study protocol increases the reliability and guides the researcher to carry out data collection from a single case study to multiple case studies. There are many researchers who emphasize the importance of the case study protocol Irani et al. (1999), Ebrahim (2005) and Remenyi (2004). Moreover, a testimony can be used from previous research in IT Governance, such as the study conducted by Spanjers et al. (2001)

where the study comprised of semi-structured interviews with directors, department managers, project managers, technical staff and end-users of organisations participating in the network. Project plans and notes were gathered and analyzed for further information. Document analysis was used to enrich and verify interview data. The validity and reliability of the study are enhanced through the use of multiple sources of information, the review of draft case reports by the interviewees, and the use of a standardized case study protocol.

In this research study, the researcher followed the protocol suggested by Yin (2009), explicitly: case study overview, fieldwork research procedures, case study questions, and finally case study report, as illustrated through the next subsections and presented in Appendix A.

5.3.1. Case Study Overview

The case study overview covers the background information about the research topic; IT Governance practice in the Public Sector, and substantive issues being investigated to assist the researcher in focusing on the objectives and main questions that need to be studied (Yin, 2009). As a procedural element of this background section, a statement about the topic which the researcher can present to anyone who may want to know about the research study, the purpose of conducting the study, and the people sponsoring is advised. This statement can be accompanied by a letter of introduction to be sent to all major interviewees and organisations that may be the subject of study. Consequently, for the purpose of conducting this research, an information sheet about the study has been prepared and distributed to all participants prior to interview.

5.3.2. Fieldwork Research Procedure

The researcher will be involved in real life situations for collecting data from different people and organisations in their everyday situations so there is the possibility of some participants withdrawing from the interview, rescheduling interview appointments more than once or documents not always being available or revealed. Thus, this contrasting process of doing

data collection leads the researcher to have explicit and well-defined field procedures encompassing guidelines for coping with unexpected situations and behaviours. The field procedures, as a part of case study protocol (Yin, 2009), need to emphasize the major tasks that will be followed during the multiple case study data collection journey of this research and these are explained to each coordinator in the first meeting, as follows:

- Gaining access to key organisations or interviewees: Since it has been considered in selecting the case organisations to have a good contact, organisations have assigned a coordinator to facilitate communication and arrangements between the researcher and the interviewees; however, rescheduling of appointments occurred more than once due to work load, unavailability or refusing.

- Defining who should be interviewed (Research Sampling Strategy): The investigation of IT Governance Practice is in this research related to information technology and therefore the interviewees should be within the scope of the IT domain. However, the researcher attempted to coordinate with each case organisation through providing a commitment first from someone senior to be able to assist with other interviewees when needed. Then, the researcher was requested to assign a coordinator to facilitate obtaining any necessary information about IT employees that would fit within this research study. This procedure was very useful especially in the case of MoI where the researcher was only allowed to interview the IT Director and the coordinator.

- Identify appropriate data gathering methods: The plan at the beginning of this research study was to use personal interview as a core method for data collection, thus the researcher developed an interview agenda that could be used to collect data from the interviewees during the semi-structured interviews and structured interviews when the COBIT assessment tool was used. However, the researcher developed an online method of collecting data that would preserve the data in a database. This alternative solution has been

attempted due to conflict of interest. This is the situation where the researcher found a repeated delay with some participants in a way that may corrupt or affect the motivations for data collection. Another is the consultancy role that sometimes the researcher found for providing useful advice. In fact, the consultancy role is useful in building trust and acceptance between the researcher and the interviewee; however, it is most important to reflect back to the case research protocol and the main issue of the researcher's presence. A similar concept is also pointed out in a study by Stuart et al. (2002) who encountered that the researcher role as an investigator was turning into a consultancy role with the issue of building trust so the information can flow between the researcher and participants. Therefore, the researcher found that using the online method was effective with the data entered by the interviewees, whereas the data collected directly by the researcher were entered into the designed forms and transcribed at a later time. Additional data was gathered from different methods, such as organisation website, observation, progress reports and mandates.

- Having sufficient resources while in the field: The researcher should be well prepared prior to the data collection for fieldwork; such as the writing instruments or forms, stationary, note paper to record any necessary comments and observations. It is beneficial also to hold a good performance digital recorder and the interviewee's consent is an important agreement that must be considered prior recording (Appendix B). In addition, the researcher requires a quiet place to conduct the interviews and to write notes privately; hence these factors have been considered in this research study. To illustrate, some interviewees share the same space with more than one colleague and it would be difficult to discuss and take notes.

- Make an interview schedule: This procedure is to make a clear schedule for each case study of the data collection activities that are expected to be completed within a specified period of time. The researcher has requested an

hour for each interview for this research study. This arrangement should be addressed some days before meeting and the time confirmed with the interviewee within the same day to avoid any misunderstanding or conflict of unexpected events; thus the researcher should be prepared in advance to arrange for another interviewee when possible.

It is an important procedure to gain interviewee confidence by establishing and explaining the confidentiality concerns of research; therefore information disclosed would not be presented using the participant's identity. The researcher asked the interviewee to describe his/her main roles and responsibilities as part of an IT community within the case study. This is to validate the prior assigned topics, as a part of the COBIT assessment tool (as illustrated in Chapter Three: Research Methodology), for the interviewee and communicated by the coordinator. Thus, the researcher considered the protection of human subjects by gaining informed consent from all participants in the case studies (Appendix B) and also explained the protection of confidentiality of those participants (Yin,2009). The researcher found that these steps led the interviewee to be more confident and better motivated to be in the mood for an interview.

5.3.3. Case Study Questions

At the core of the research protocol is a set of questions reflecting the inquiry of research (Yin, 2009). There are some characteristics that distinguish case study questions from those in a survey instrument. Firstly, the protocol questions are posed to the researcher and not to the interviewee. This will assist the researcher in maintaining some form of direction, focus and prompts to the main issues that need to be addressed during each case study interview. Secondly, each question is accompanied by a space for the interviewee to add comments or observations taken by the researcher. The questions are developed by the researcher and based on the COBIT 4.1 Framework to identify the maturity of each case study within the covered processes.

5.3.4. Case Study Report

Case study report is an important part of the research protocol and the researcher must be concerned with the design of the final case study report (Yin, 2009). In spite of the extent of the data collection and documents retrieved from case study research, the researcher should prepare a basic outline of the case study report to facilitate the collection of relevant data in its appropriate format, therefore reducing time if return visits to the case study site are needed. Therefore, a basic outline for the case study report has been drafted to show process assessment results for each organisation (Process assessment result report available within Appendix A) as explained to the coordinator in the first meeting. The report outlines the 18 selected processes for assessing the IT Governance maturity with its corresponding results in each level. Some cases requested clarity on COBIT 4.1 maturity assessment scale to enable them to plan their insufficiency levels. The researcher informed the IT Director in person and in other cases informed the coordinator. This will be further illustrated in Chapter Six: data analysis and results.

5.4. Overview of Research Case studies

From the previous section, the researcher defined the details of case study protocol including the fieldwork research procedures. Therefore, in this section, the researcher introduces a background or an overview of the five case organisations and IT Director Structure. These are selected from 26 ministries and 33 government entities in the Kingdom of Bahrain for this study (Authority, 2015). The details mentioned are informed from the organisation's documents used during meetings with the coordinator and others are extracted from the organisation's website, such as visions and missions of the organisation. The researcher tried to investigate some facts, for example number of employees in the organisation compared to the number of employees working in the IT Directorate. Almost all organisations revealed the number of IT Directorate employees, while the other numbers remained confidential. The researcher observed similar importance and objectives for all IT Directorates, however, IT Directorate structures differ (as shown in Table 5. 1: Summary of the five case studies). In spite of these differences, the same roles and responsibilities were allocated and performed.

5.5.1. Case Study One (Ministry of Education)

- **Overview**

The Ministry of Education (MoE) seeks to develop a qualitative education system to reach a high degree of excellence and creativity as pointed out on the organisation's website (Directorate, 2015). It is stated that this vision emanated from the Islamic religion's lofty principles and values and the kingdom of Bahrain's interactions with human civilization to satisfy the requirements of continuous development that conforms to the international standards. The MoE missions are not limited to providing educational opportunities for all citizens, rather to developing mental, physical and skills suited within the era of globalisation. The use of technology is not only in teaching methodologies but it should also percolate to the administrative aspects of education to achieve excellence and quality. According to the statistics available through the IT Directorate, the total number of employees working in schools and directors of MoE is 4031 employees including 68 employees in the IT Directorate.

- **IT Directorate in MoE**

In the Kingdom of Bahrain, there is a need to see technology as a beacon which will show us the path towards progress for the nation. This is revealed from the adopted Information technology development projects, such as King Hamad's Schools of Future Project and the Digital Transformation Project, and the yearly allocated budgets to the education sector of a total of 347,117, 294 Bahrain Dinars including expenditure on projects and assets as reported in 2014 (Education, 2015). To achieve this goal, we need to have Management Information Systems with extensive databases, and integrated and interconnected data. This will help schools, departments and ministries to carry out their tasks effectively & efficiently and enable officials to take decisions based on facts, thereby achieving objectives.

- **IT Structure**

The IT Directorate in the MoE is divided into four sections, the Application Development Section, Database Management and Internet Section, Standards and Quality Assurance Section and Technical Support and Network Security Section. The participants selected from each section are shown in Table 5.1: Process Distribution table for MoE. The four sections are illustrated as follows:

❖ Application Development Section

This section consists of programmers and system developers with wide experience and exposure to different IT systems. They had specific experience in managing IT infrastructure of schools and educational departments as well as experience of systems which manage finance and other administrative aspects. IT systems developed had to be state-of-the-art keeping pace with the latest developments. This infrastructure has to be established in record time so that reports can be generated which will enable taking the right decisions supported by facts and figures.

❖ Database Management and Internet Section:

A separate section has to be established to manage databases and for data transfer through the Internet. The centralized database has to be managed efficiently to have minimum storage space and proper archiving of data. This will protect against loss of data, and in case of any malfunction, it can be quickly repaired and data recovered. Integrity and consistency of data transferred has to be ensured when information is shared between users through multiple applications. Security and confidentiality of data access has to be maintained through specific access restrictions.

MoE aims to provide faster and better ways to connect and communicate with the public and for government services to various parties dealing with the ministry. This has to be completed as soon as possible. This will be launched with eight services as electronic transactions through the Ministry's website and self-service mobile platforms. The website was designed by integrating the important aspects and services such as for the ministry. The website has been provided with a range of interactive services which enables the public to participate and communicate with the Ministry through electronic and multimedia library service and newsletters. To have larger participation of users, website access through mobile phone was developed.

❖ Standards and Quality Assurance Section:

The main responsibility is to ensure that all policies and procedures of all sections of the Management Information Systems are in accordance with the standards and specifications in the field of Information Technology. The quality is managed by developing standards for all operations of Information Technology Directorate – in the areas of software development, database management, establishing standards for procurement like specifications, preparation of enquiry, evaluation of tenders, follow-up on deliveries and finally distribution of appropriate computer hardware to the schools and departments of the Ministry. It ensures that the devices conform to the latest and best specifications. The obsolete hardware is replaced at appropriate times. The section also ensures that all activities are properly documented.

❖ Technical Support and Network Security Section:

The section acts as the main engine for all IT operations. It monitors and ensures efficient operations of IT infrastructure at the Ministry of Education. The servers and other hardware are customized to meet the needs and requirements of the central systems. They ensure that the systems conform to the policies of the Ministry of Interior with regards to networking of devices in all schools and connectivity with communication lines. The section also provides technical support to users by ensuring that their complaints are attended at the shortest possible time.

COBIT 4.1 PROCESS	Director	Chief of Database management & Internet	Chief of standards & quality assurance	Chief of technical support & network security	Chief of Application Development	Head, Administrative Information System Development	Head Quality	Head, Network and Security	Head, Technical documentation	Head, operation and support	Head, support and maintenance	System Development specialist
P01: Define a Strategic IT Plan	•											
PO3: Determine Technological Direction	•				•							
PO5: Management the IT Investment	•											
P07: Manage IT Human Resources					•							
P08: Manage Quality			•				•					
PO9: Assess and Manage IT Risks				•						•		
P010: Manage Projects			•									
AI2: Acquire and Maintain Application Software						•						•
AI5: Procure IT Resources			•				•					
AI6: Manage Changes					•	•						•
DS1: Define and Manage Service Levels		•	•	•		•			•	•	•	•
DS4: Ensure Continuous Service	•			•							•	
DS5: Ensure System Security						•		•				
DS10: Manage Problems		•		•					•	•		
DS11: Manage Data		•			•			•	•			
ME1: Monitor and Evaluate IT Performance	•											
ME2: Monitor and Evaluate Internal Control			•				•	•				
ME4: Provide IT Governance	•											

Table 5. 1: Process Distribution for MoE

5.5.2. Case Study Two (Ministry of Work)

- **Overview**

The Ministry of Work (MoW) aims to deliver physical infrastructure that develops the quality of life for all residents of the Kingdom of Bahrain (Work, 2015). They also reported that "this infrastructure supports national development goals by maximising the potential of the kingdom for economic progress". Consequently, the MoW is the constructing arm of the government of the Kingdom of Bahrain. Therefore, MoW oversees the infrastructure developments consisting of the strategic planning, design, construction and maintenance of the public road network and the drainage system for the Kingdom. In addition, the MoW oversees design construction, project management and maintenance of public buildings. The MoW comprises thirteen directorates including the Information Technology Directorate (IT Directorate) with approximately 66 employees.

- **IT Directorate in MoW**

The IT Directorate in MoW is responsible for providing technical expertise and advice on all information technology issues. As such, it is a cornerstone in the Ministry's mission to establish itself at the forefront of technology and technical expertise. Access to correct, up-to-date information is critical in fulfilling the multiple needs of sectors and Directorates. ITD draws up and implements strategic plans for the Ministry's information systems based on the Ministry's current and future requirements, and in co-ordination with top management and other relevant directorates. It also works to ensure that the Ministry's information systems, applications, databases and networks meet stringent local and global specifications, best practices and standards.

- **IT Structure**

The responsibilities in the IT Directorate are distributed among four sections: Information system security and quality assurance section, Information Systems Development Section, Computer Technical Services Section and User Support & Computer Maintenance Section.

The researcher illustrated the participant's selection from each section as shown in Table 5.2: Process Distribution table for MoW. These are summarized as follows (the researcher listed the main responsibilities as the details are similar to MoE).

- ❖ Information Systems Security & Quality Assurance Section (ISSQAS) is responsible for:
    - Hardware Procurement
    - Quality Assurance on ITD deliverables
    - Improving & Maintaining ITD processes and policies
    - Planning, implementing, maintaining ICT security policies and operations
- ❖ Information Systems Development Section (ISDS) is responsible for:
    - Gathering & Analyzing application requirements
    - Developing new Applications such as; Geographical Information Systems, Management Information Systems and E-Services Systems.
    - Operating, improving, and Maintaining applications
- ❖ Computer Technical Services Section (CTSS) is responsible for:
    - Planning, Implementing, operating, and Maintaining ICT infrastructure: Network, WiFi, Data Center, Servers, Data Storage and Backups and finally the IP Telephony service.
    - Planning, Implementing, operating, and Maintaining database systems.
    - Planning, Implementing, operating, and maintaining communication services (e-mail, e-fax, e-SMS, Instant messaging, blackberry services).

COBIT 4.1 PROCESS	Director	Chief, Information systems Development	Chief, Information Security & Quality Assurance	Head, Management Information Systems	Head, Computer Maintenance Services	Head, Database Administration	Senior Computer Specialist	Senior Computer Security	Computer Systems Administrator	Computer Qaulity Assurance Specialist	Senior Computer Quality Assurance
P01: Define a Strategic IT Plan	●										
PO3: Determine Technological Direction	●	●									
PO5: Management the IT Investment	●										
P07: Manage IT Human Resources					●						
P08: Manage Quality			●								●
PO9: Assess and Manage IT Risks			●							●	
P010: Manage Projects						●					●
AI2: Acquire and Maintain Application Software				●			●		●		
AI5: Procure IT Resources			●		●						
AI6: Manage Changes				●							
DS1: Define and Manage Service Levels				●							●
DS4: Ensure Continuous Service	●				●				●		
DS5: Ensure System Security				●				●			
DS10: Manage Problems						●				●	
DS11: Manage Data							●	●			
ME1: Monitor and Evaluate IT Performance	●					●					
ME2: Monitor and Evaluate Internal Control			●					●			●
ME4: Provide IT Governance	●										

Table 5. 2: Process Distribution for MoW

- ❖ User Support & Computer Maintenance Section (USCMS) is responsible for:
  - Providing support on all ICT services to all end users
  - Providing hardware and software support and services for end-user computers and peripherals

- Maintaining & Improving user support services and procedures
- ICT call center and helpdesk management

5.5.3. Case Study Three (Ministry of Interior)

- **Overview**

The Ministry of Interior (MoI) has one of the most important missions "maintenance of security, general order and safety, and low enforcement" as reported on the MoI's website (Creativity, 2015). In addition, the MoI uses the latest technology in order to save time and effort for improving the quality of its services and fulfilling its duties. The ministry is dedicated to achieving its goals, such as: human resource development (police characteristics and adopting high levels of efficiency), making the environment secure (prevention of crime and securing general safety) and security preparedness (law enforcement and crisis management).

- **IT Directorate**

MoI is responsible for law enforcement and public safety in the Kingdom of Bahrain, therefore it is a crucial mission to manage the implementation of information technology and electronic systems among all divisions and directorates under the shadow of MoI. The aim of this administration is the integration and cooperation and spectrum to introduce the technology in all phases of the work and development of services. In the near future, this administration also seeks to introduce more regulations that will develop, preserve and maintain the provided services. The number of employees in the IT Directorate is 110.

IT Structure

The IT Directorate is divided into three main sections: computer operations section, electronic solutions section, and Internet and electronic services section. The participants selected from each section are shown in Table 5.3: Process Distribution table for MoI.

COBIT 4.1 PROCESS	Director	Head, System Development	Head, Quality and control	Senior, administrative system development	Senior, Support and Maintenance	Senior, System administrator	Senior, Network administrator/specialist	Senior, Quality specialist
P01: Define a Strategic IT Plan	●							
PO3: Determine Technological Direction	●	●						
PO5: Management the IT Investment	●							
P07: Manage IT Human Resources		●			●			
P08: Manage Quality			●					●
PO9: Assess and Manage IT Risks							●	
P010: Manage Projects			●					
AI2: Acquire and Maintain Application Software				●				
AI5: Procure IT Resources			●		●			●
AI6: Manage Changes		●		●				
DS1: Define and Manage Service Levels			●	●		●	●	
DS4: Ensure Continuous Service	●				●			
DS5: Ensure System Security				●				
DS10: Manage Problems						●	●	
DS11: Manage Data		●				●		
ME1: Monitor and Evaluate IT Performance	●							
ME2: Monitor and Evaluate Internal Control			●					●
ME4: Provide IT Governance	●							

Table 5. 3: Process Distribution for MoI

The sections are illustrated as follows:

- Computer Operations Section is responsible for providing technical support and maintenance of computer hardware and peripherals.
- Electronic Solutions Section is responsible for developing, implementing, maintaining and supporting applications.

- Internet and electronic services Section is responsible for designing and developing Internet applications.

5.5.4. Case Study Four (Ministry of Health)

- **Overview**

The Ministry of Health (MoH) vision states that "all populations have access to quality health care through their lifetime" as mentioned on its website (Health, 2015). In addition, the MoH in partnership with stakeholders lead an informed, integrated, and regulated health system to ensure the availability of high quality service to all populations. The ministry plays a major role in being the custodian of all health information in the Kingdom of Bahrain.

- **IT Directorate**

Bahrain Health Information Center (BHIC) was established in early 1980. In 1997 (BHIC) it was expanded to the Health Information Directorate (HID). The number of MoH staff in HID is 42. HID is responsible for the planning, development, implementation, management and support of the MoH Information Solutions. It serves as the primary expert for IT for approximately 9,000 employees working in the Ministry. The HID vision is to provide the right information to the right people at the right time in order to provide the best services and health outcomes at reasonable cost. The following summarizes the HID Mission according to the Bahrain Health Strategy:

- To provide an information communication technology infrastructure that will link and support transactions and information sharing between government regulators, public healthcare organisations and the people of Bahrain.
- To provide a National Health Information Centre that will provide real time online analytical decision support tools to assist in the improvement of daily operations and clinical practice, as well as data warehouse decision support tools for analyzing

retrospective information that will assist in prospectively planning improvements for the quality of services provided.

- ❖ Develop a program of process reengineering to support the implementation of information and communication technology.
- ❖ To provide an integrated healthcare provider system that will support referrals and information sharing between private and public clinical venues of tertiary, secondary, or primary care across the kingdom.
- ❖ To provide Insurance Based Funding System Software that supports the provider/payer/regulatory requirements.

- **IT Structure**

The HID is divided into four units; technical support unit, decision support unit, application development unit and finally advisor and project officer. The participants selected from each section are shown in Table 5.4: Process Distribution table for MoH. The four units are illustrated as follows:

- ❖ Technical Support Unit: The major role played by TSU is building the MoH IT infra-structure and this is achieved by planning, designing, selecting, implementing and maintaining all computer networks (LAN&WAN) and hardware and its peripherals. TSU continue their support to all MoH staff through four computerized help desk services.

- ❖ Decision Support Unit (DSU): The main responsibilities of DSU are to provide information and health statistics to support the decision-making process through reports and publications that reflects the Kingdom's health status, data administration and management. Quality assurance of HID deliverables is the main responsible party for communication services through the Ministry. DSU will undertake the implementation of Groupware email service and the development and enhancement of the intranet website as well as the MoH internet website.

- Application Development Unit (ADU): The main responsibilities of ADU are to develop, implement maintain and support applications for all business areas. The main supported applications are patient admission, transfer, discharge, financials, radiology, laboratory, pharmacy, and logistic services. The structure of the ADU consists of Health System (Health), Administration and Finance, and Online Inventory Management System (OLIMS) / Relational Database Management System (RDBMS). The following diagram illustrates the ADU structure.

- Advisor & Project Office: The main functions of this section are to plan, co-ordinate, monitor and report all projects conducted within HID. The section will also be responsible for managing high risk and multi-sectional projects. HID has been using the government approved Navigator Methodology to manage all the IT projects. Furthermore, the project office has the responsibility of managing the Ministry of Health Information System (MHIS). This has included developing the IT strategy, tendering and evaluating for the proposed system. It is envisaged that once the full team for the project office is in place; their responsibilities will expand to co-ordinate with other business areas and government Ministries.

COBIT 4.1 PROCESS	Director	Head of Performance Management	System Analyst QA	Senior Security Admin	Head of Knowledge Management	Computer System Analyst	Senior Database Administrator	Head of Program Management System	Computer System Analyst (2)	Head of Application Management System	Senior Computer System Analyst	Head Of Customer Technical Support	Computer System Analyst (2)
P01: Define a Strategic IT Plan	●												
PO3: Determine Technological Direction	●									●			
PO5: Management the IT Investment	●												
P07: Manage IT Human Resources					●					●		●	
P08: Manage Quality		●	●	●									
PO9: Assess and Manage IT Risks				●									
P010: Manage Projects		●			●								
AI2: Acquire and Maintain Application Software						●		●	●	●	●		
AI5: Procure IT Resources												●	●
AI6: Manage Changes						●		●	●		●		
DS1: Define and Manage Service Levels		●				●	●	●	●		●		
DS4: Ensure Continuous Service	●											●	●
DS5: Ensure System Security										●			
DS10: Manage Problems							●						●
DS11: Manage Data							●			●			
ME1: Monitor and Evaluate IT Performance	●												
ME2: Monitor and Evaluate Internal Control		●	●	●									
ME4: Provide IT Governance	●												

Table 5. 4: Process Distribution for MoH

5.5.5. Case Study Five (University of Bahrain)

- **Overview**

The University of Bahrain's (UoB) vision is to be "an internationally recognised university for excellence in student learning, innovation research and community engagement that contributes to the economic vitality and quality of life in the Kingdom of Bahrain" as mentioned on the university's website (Bahrain, 2015b). The UoB states a number of objectives for its strategic plan such as: aligning governance and administration with international best practices, and providing sustainable infrastructure and resources.

- **IT Centre**

The Information Technology Centre (IT centre) was established at the University of Bahrain in 1991 to be entrusted and responsible for the planning, provision and management of an integrated and effective information technology infrastructure and application. Moreover, usage and implementation of the latest methods and techniques, programs, systems, and equipment in the field of information technology in the university ensure they keep pace with the changes and improvements in this active area/field. There are 31 employees working in the IT centre. The Centre aims to achieve the following main objectives:

- Provision of infrastructures, systems, and high quality technical services that facilitate operation of the university, consistent with the expectations and needs of the university community.
- Designing and developing effective computer information systems and high quality IT services in line with the expectations and needs of the university administration and the various colleges and departments, to effectively and accurately improve the functionality and the performance of the work in all educational and administrative aspects.
- Manage information technology like a strategic asset.

- Strengthen support and reinforce the academic mission, and functions and enrichment of the educational process and scientific research in the university.
- Provision of studies and consultancy in the field of information technology for all the university.
- Develop and implement controls and policies for the usage of information technology in the university.
- Automation of all the administrative and financial functions in the university.

- **IT Structure**

The Information Technology Centre consists of four different divisions that integrate and coordinate with each other in order to achieve the objectives and goals of the Centre. The participants selected from each division are shown in Table 5.5: Process Distribution table for UoB. Each of these four divisions has its own responsibilities, functions, and technical services that it provides to the university community:

- Information Networks Division: This division is mainly responsible for the design, administration, maintenance, and security of the University local information network (LAN) that connects the computer devices in use in the different colleges and departments, to facilitate ease of contact in order to exchange and share programs, files, and information. This network interconnects and links between more than fifty (50) of the university buildings, where the IT centre is considered its centre, and it consists of six (6) major core switches, ninety (90) distribution switches, two hundred and seventy (270) edge switches and more than eight thousand (8000) network points or nodes. The following are the main functions and services provided by this division:
  - Providing the Internet service (wired and/or wireless) to the university staff and students, through linking the local university computer network to the international World Wide Web and ensuring the permanency and sustainability of this service so as not to be misused by the users.
  - Providing the e-mail service to the university staff and students and issuing the necessary user accounts for them.

- Providing security and safety to the university local area network (computer network), database and information system servers from viruses, hacking or sabotage attempts and providing the necessary technical support.
- Administrating and managing the university servers that host the various departments' information systems and services and oversee the necessary updating and maintenance operations.
- Providing technical needs and support for any events held within or outside the university campus by the various deanships, colleges, and departments.

❖ Information Systems Division: This division is responsible for the design and creation and development, maintenance and protection of the university database and computer information systems, which made us in the University of Bahrain very proud locally and globally with the ability of the staff of this division to design and develop the university computer information systems in-house without the need for outsourcing. The number of these information systems has reached more than twenty-one (21) and they were developed based on oracle databases; the most important of those are the Admission and Registration system, Human Resource system, Finance and Budget system, Purchasing and Procurement System, and the Assets system. The following are the main functions and services provided by this division:

- Analyzing information systems in use and making the necessary adjustments in accordance with the changing needs of users in various departments and sections.
- Providing security and protection to the university database and computer information systems.
- Granting or withholding user privileges of the university's computer information systems commensurate with the nature and duties of their work.

- Training the university staff on the use of information systems that have been developed.
- Issuing of user accounts (User_Id, password) for the academic and administrative staff members for using the university information systems.
- Issuing of user accounts (User_Id, password) for the students for using the online registration systems.

COBIT 4.1 PROCESS	Director	Vice President	Head, Information System	Senior, System Analyst	System Analyst	Programmer, DB	Head, Network	System Specialist	Network Specialist	Information Security Specialist	Head, Internet Services	Web Designer Specialist	Web Designer	Head, Maintenance and Support	Technical Support Specialist (2)
P01: Define a Strategic IT Plan	●														
PO3: Determine Technological Direction		●													
PO5: Management the IT Investment	●														
P07: Manage IT Human Resources														●	
P08: Manage Quality		●													
PO9: Assess and Manage IT Risks							●	●	●	●					●
P010: Manage Projects		●													
AI2: Acquire and Maintain Application Software			●	●	●	●					●	●			
AI5: Procure IT Resources														●	
AI6: Manage Changes			●	●	●	●									
DS1: Define and Manage Service Levels			●	●	●	●	●	●			●		●		
DS4: Ensure Continuous Service	●								●					●	●
DS5: Ensure System Security			●							●					
DS10: Manage Problems							●	●			●	●	●		
DS11: Manage Data										●			●		
ME1: Monitor and Evaluate IT Performance	●														
ME2: Monitor and Evaluate Internal Control										●					
ME4: Provide IT Governance	●														

Table 5. 5: Process Distribution for UoB

❖ Internet Services Division: This division is responsible for the design, development, management, output, and maintenance of the university website in addition to various Internet applications. The following are the main functions and services provided by this division:

- Designing and developing the web pages for the university faculty members on the university website where the number of registered faculty members has reached one hundred and ninety-two (192) members, and issuing special accounts (User_Id, password) that will enable them to establish their pages and add and modify the content.

- Designing and developing Internet applications which are required by various university colleges and departments and issuing special accounts (User_Id, password) that will enable the authorized staff to add and modify data and content.

- Updating and modifying the content of the university website regularly with events, news, publications, etc.

- Designing and developing some web information systems such as the Telephone Directory, Administration Training, and Security Permits.

❖ Technical Support and Maintenance Division: This division is responsible for providing technical support and maintenance of computer hardware and peripherals (printers, scanners, plotters, etc.) in use at the university and performing all the necessary repairs to sustain its operation and usage status, where money would have been spent on specialized vendors or companies to perform these specialized tasks. Their estimated numbers are more than seven thousand (7000) computers and more than two thousand (2000) printers. The following are the main functions and services provided by this division:

- Determining the technical specifications of computer hardware and peripherals to be purchased for use in the various university colleges and departments.

- Periodic or upon request inspection of computer systems and peripherals used at the university to determine their suitability for use and the necessary needed repairs to sustain their operation and prepare and write the technical reports upon which replacement or exclusion is decided.

- Installing and configuring newly purchased computer systems and peripherals for the end users and providing them with the necessary applications and protection software programs, and so on.

- Providing technical needs and support for any events held within or outside the university campus by the various deanships, colleges, and departments.

5.5. The Case Data

With reference to Tables 5.1, 5.2, 5.3, 5.4, 5.5, the researcher illustrated each case study and the selected participants engaged in this research study. The collection of data was based on the 18 processes selected from the COBIT 4.1 framework. The reader may notice that the number of participants varies. This is because of the specialized areas of each process; hence, the researcher was keen to map each process with the participant's title, main role and responsibilities. Table 5. 6: Summary of the five case studies shows the number of employees participating in this study from each IT Directorate in the organisations. This part is further illustrated in detail through the next chapter.

Case study	IT Structure	IT employees	No. of Participants in research
MoE	Four sections: application development section, database management & Internet section, standards & quality section, technical support & network security section.	68	12
MoW	Four sections: information system security & quality assurance section, information system development section, computer technical services section, user support & computer maintenance section.	66	11
MoI	Three sections: computer operations section, electronic solutions section, Internet & electronic services section.	110	8
MoH	Four units: technical support unit, decision support unit, application development unit, advisor & project office.	42	15
UoB	Four divisions: information networks division, information systems division, Internet services division, technical support & maintenance division.	31	16

Table 5. 6: Summary of the five case studies

5.6. Conclusion

The researcher introduced a detailed protocol for the research investigation within the five case studies. Case study research is a rich opportunity so the researcher justified fieldwork procedures that have been replicated and used in each case. The researcher presented an intensive background on each case (available through section 5.5) and this is an important screening step to map each COBIT process to its desired person. The information provided reveals the degree of cooperation and confidentiality of information available to the researcher to add to this thesis. The next chapter will describe the data analysis and results.

Chapter 6

Data Analysis and Results

In Chapter Two, the researcher presented the COBIT 4.1 framework and maturity model. Then in Chapter Three, the researcher explained the case study protocol with detailed fieldwork procedures adopted within the five case studies selected from public sector organisations as per details provided in Chapter Five. It was common that an IT department operated separately from other business units as stated by Hardy (2006). However, the responsibility of IT Governance is one aspect of a broad agenda of corporate governance.

This chapter describes and analyses the empirical data of the five case studies perspectives. These describe the 18 IT processes selected from the four domains of the COBIT framework as explained in the case study data collection in Chapter Three.

6.1. Introduction

This chapter presents the results of the five case studies perspectives that describe 18 IT processes selected from the four domains of the COBIT framework. The five case studies, as described in detail in the previous chapter, were selected from public sector organisations in the Kingdom of Bahrain: the Ministry of Education (MoE), the Ministry of Health (MoH), the Ministry of Interior (MoI), Ministry of Work and the University of Bahrain. The surveys, as explained in Chapter Three and found in Appendix A, were used to collect the empirical data that represent the values for the maturity levels. The distribution of the survey was based on a sampling strategy with factors that included the aim of sampling, the type of purposeful sampling and the research method employed Sandelowski (1995). Therefore, the researcher decided to seek people in IT Directorates; the main reason for using this method is the domain related to information technology and therefore the interviewees should be within the scope of the IT domain. However, the researcher attempted to coordinate with the case organisation through providing a commitment first from a senior manager to be able to assist with other interviewees when needed. Then, the researcher requested them to assign a coordinator to facilitate the research process, providing any necessary information about IT employees that would fit within this research study.

The chapter begins with a high-level overview of the research analysis to provide details on the demographics of the respondents by both gender representation and type of work. It also provides a clear figure of the exact numbers of respondents selected from the IT domain. This will measure the maturity level for each case organisation when presenting maturity level figures for each process. The chapter then moves on to a detailed review of the maturity calculation method (see Section 6.4) and COBIT maturity scale used to represent the results (see Section 6.5). This maturity score provides the position of process maturity according to a standard scale adopted from the COBIT 4.1 framework. Therefore, understanding the current position of process maturity will assist in planning the next maturity level. The researcher also presents the most mature processes showing significant scores (See Section 6.6). For the purpose of identifying gaps within IT Governance practice in the public sector, the researcher continues to present the weakest processes (see Section 6.7) to find recommendations to bridge or mind these gaps.

6.2. Demographics of the respondents

More than 62 respondents participated in this study; 28 of the respondents used the online version and the remaining 34 had a face-to-face interview process. The number of participants from each job level is shown in Table 6.1: Number of participants. Figure 6.1: Gender Representation shows that 71% of the respondents were male, and 29% were females. This representation is gender balanced in accordance with women in Bahrain, representing 35% of the labour force of Bahrain compared with the distribution of the participation of female and male workers in the public sector of 24535 and 27888 respectively (Board, 2013, Women, 2013).

The research used an assessment form adopted from the COBIT framework for conducting face-to-face interviews. Then, the researcher developed an online tool to communicate with participants through email correspondence followed by telephone communication to provide the necessary explanations as required from the participants and as illustrated in Chapter Three (Section 3.3.7). Conforming with this research sampling strategy, illustrated in Chapter Five, different groups of job levels are presented in Figure 6.2: Respondents' Type of Work.

Organisation	Director	Vice President	Chief of Section	Head of Group/Section	Senior Specialist/Analyst	others	Total
MoW	1	0	1	4	3	2	11
MoH	1	0	0	5	5	4	15
MoE	1	0	1	7	1	2	12
UoB	1	1	0	4	1	9	16
MoI	1	0	2	0	1	4	8
Total	5	1	4	20	11	21	62

Table 6. 1: Number of participants

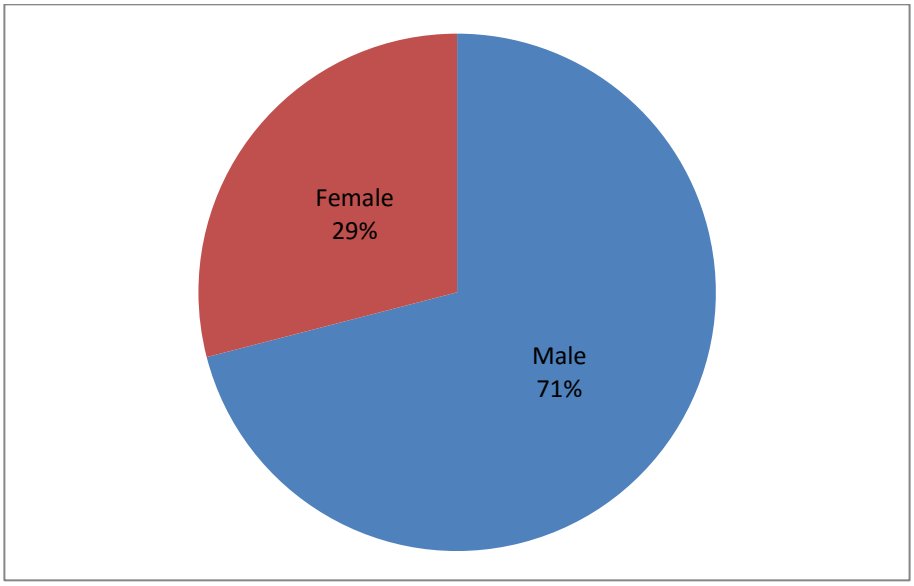


Figure 6. 1: Gender Representation

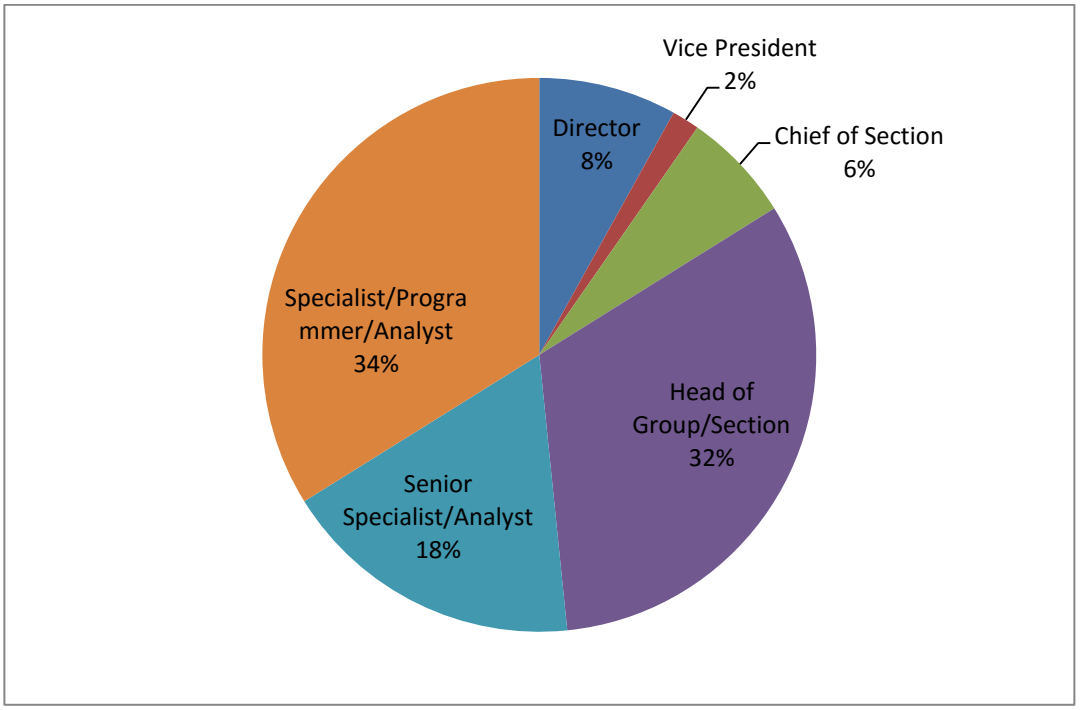


Figure 6.2: Respondents' type of work

6.3. Overview of the research analysis

Throughout this investigation process, the participants were interviewed face-to-face by using a semi-structured interview method to identify the main duties assigned to their position and titles. This was followed by assigning the relevant pre-determined questionnaires built based on the COBIT framework; however, the participants freely spoke on their practices when asked about issues related to their domain. As part of the data collection method, an online survey was developed as an alternative data gathering tool for participants who were senior management with limit available time, and who found that meeting affected job commitments. Only 28 of the respondents used the online version and the remaining used face-to-face interview process. Incomplete responses were revisited and the respondents were communicated again to finally complete the survey. Every question was answered by all 62 participants by face to face survey, phone conversations and through email.

Num	Process Name
Plan and Organize	
1	PO1 Define a strategic IT plan.
2	PO3 Determine technological direction.
3	PO5 Manage the IT investment.
4	PO7 Manage IT human resources.
5	PO8 Manage quality.
6	PO9 Assess and manage IT risks.
7	PO10 Manage projects.
Acquire and Implement	
8	AI2 Acquire and maintain application software.
9	AI5 Procure IT resources.
10	AI6 Manage changes.
Deliver and Support	
11	DS1 Define and manage service levels.
12	DS4 Ensure continuous service.
13	DS5 Ensure systems security.
14	DS10 Manage problems.
15	DS11 Manage data.
Monitor and Evaluate	
16	ME1 Monitor and evaluate IT performance.
17	ME2 Monitor and evaluate internal control.
18	ME4 Provide IT governance.

Table 6. 2: Selected 18 COBIT 4.1 Processes

Some information about survey participants remained confidential to protect their identity and eight responses were communicated through the coordinator. In this particular case study (case MoI); the coordinator adopted a protocol to communicate with the selected team according to the research requirement. Detailed explanation of the protocol was provided to the coordinator along with further answers when needed.

The questionnaire was built on selecting 18 important processes that were relevant to the public sector organisations as concluded from the pre-test and the pilot experiment with experts and academics in the field (Chapter Three, Section 3.4). The selected process is further divided into a set of statements and this will further produce sufficient data from each case (Table 6.2: Selected 18 COBIT 4.1 Processes). A similar view of selecting specific processes from COBIT was adopted in previous studies (Pederiva, 2003, Guldentops et al., 2002). The content of the questionnaire was derived from the COBIT 4.1 maturity model, and it relies on description or 'scenario' concept because every maturity level is considered to be a scenario. Each process scenario is divided into separate questionnaire statements; therefore, the researcher developed 18 questionnaires and a general questionnaire.

The distribution of the selected 18 questionnaires was based on the role and responsibilities of each participant. This distribution was discussed with and agreed by the coordinator / IT Director in the first scheduled general meeting for data collection; illustrated in Table 6.3: Process Distribution List.

In Chapter Five, the researcher presented each case study and the distribution of the 18 questionnaires. In Table 6.3: Process Distribution List, the researcher summaries the selected 18 processes for the five case studies and presents the distribution of participants according to their role and responsibilities.

Process	Director	Vice President	Chief of Section	Head of Group/Section	Senior Specialist /Analyst	Others
PO1	●					
PO3	●					
PO5	●					
PO7			●	●	●	
PO8		●	●	●		●
PO9			●	●	●	●
PO10		●	●	●	●	●
AI2				●	●	●
AI5			●	●	●	●
AI6			●	●	●	●
DS1			●	●	●	●
DS4	●		●	●	●	●
DS5				●	●	
DS10			●	●	●	●
DS11			●	●	●	●
ME1	●		●			
ME2			●	●	●	●
ME4	●					

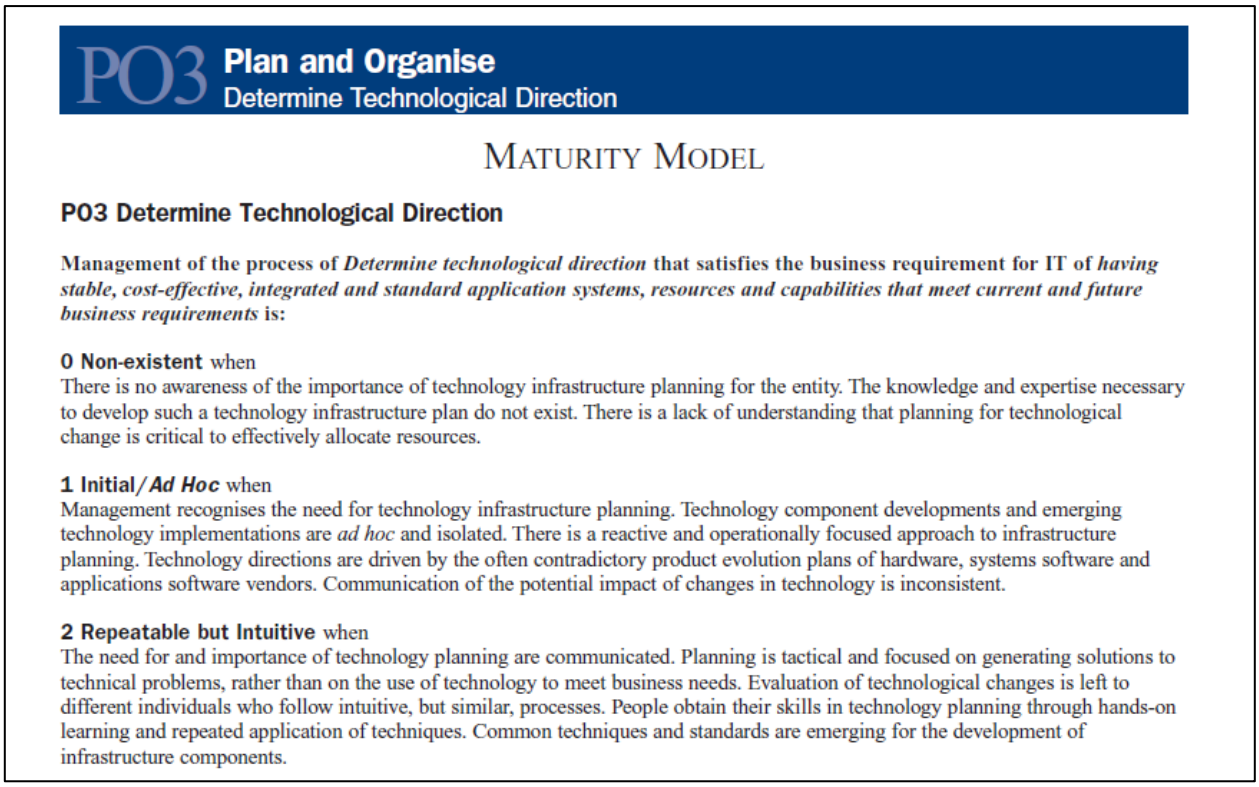
Table 6. 3: Process Distribution list

For example, process P01: Define a strategic IT plan, PO3: Determine technological direction and P05: Manage the IT investment are only assigned to Directors in the five case studies because they are related to their job description (role and responsibilities). The different organisational structure between the five public sector organisations studied shows how processes are assigned to different job titles because they are assigned additional roles and responsibilities or delegated to other participants. This stage informed the researcher on how IT functions are carried out and therefore, where decision making authority is located.

6.4. Maturity Calculation

In Chapter Two and Chapter Three, the researcher presented the background on the COBIT 4.1 maturity model and how it is divided into six levels (known as maturity scale). Therefore, each process (18 processes) is allocated to its own maturity model with its corresponding scenarios related to the six levels (non-existent, initial/ad hoc, repeated but intuitive, defined, managed and measurable, optimized). This section will provide information regarding maturity calculations of the processes and IT Governance domains as described in detail in Chapter Two; the research participants were selected from public sector organisations based in the Kingdom of Bahrain (MoE, MoH, MoW, MoI and UoB). The maturity level for each organisation was calculated through adopting a number of functions to facilitate the calculation of the maturity level for each organisation; the collected data (questionnaire answers) was exported to Microsoft Office Excel.

The research used the descriptions of the COBIT4.1 maturity model. These are viewed as a set of statements, an example is shown in Figure 6.3: Example of PO1 Define a strategic IT Plan maturity level 0 to 2 descriptions. The number of questions (statements) differs for each process. When the maturity model description was studied, it was noted that each description could be answered by either true, partially true, false or partially false (Completely, Quite a lot, Not at all or A little) as pointed out by (Pederiva, 2003). The answers were mapped to the numeric values described in Table 6.4: Agreement with statements' numeric values. A sample of the questionnaire arrangements is shown in Table 6.5: A sample of questionnaire arrangements.



PO3 Plan and Organise
Determine Technological Direction

MATURITY MODEL

PO3 Determine Technological Direction

Management of the process of *Determine technological direction* that satisfies the business requirement for IT of *having stable, cost-effective, integrated and standard application systems, resources and capabilities that meet current and future business requirements* is:

0 Non-existent when
There is no awareness of the importance of technology infrastructure planning for the entity. The knowledge and expertise necessary to develop such a technology infrastructure plan do not exist. There is a lack of understanding that planning for technological change is critical to effectively allocate resources.

1 Initial/*Ad Hoc* when
Management recognises the need for technology infrastructure planning. Technology component developments and emerging technology implementations are *ad hoc* and isolated. There is a reactive and operationally focused approach to infrastructure planning. Technology directions are driven by the often contradictory product evolution plans of hardware, systems software and applications software vendors. Communication of the potential impact of changes in technology is inconsistent.

2 Repeatable but Intuitive when
The need for and importance of technology planning are communicated. Planning is tactical and focused on generating solutions to technical problems, rather than on the use of technology to meet business needs. Evaluation of technological changes is left to different individuals who follow intuitive, but similar, processes. People obtain their skills in technology planning through hands-on learning and repeated application of techniques. Common techniques and standards are emerging for the development of infrastructure components.

Figure 6. 3: Example of PO3 Determine Technology Direction maturity description for level 0 to 2 (ITGI, 2007)

Agreement with statement	Value
Not at all	0
A little	0.33
Quite a lot	0.66
Completely	1

Table 6. 4: Agreement with statements' numeric values

In the stage of conducting the data collection and as explained in Chapter Three, the use of face-to-face method consumed more time compared to participants using the web-based version. This is due to the process of data entry into the Excel spreadsheet, formulas and other features to facilitate the flow between different sheets. The web-based data could then be

exported to the spread sheet; however that was also a lengthy process and required time to format according to standard tables.

The questionnaires are composed of different statements and each with their own value of 0, 0.33, 0.66 or 1. These are grouped in accordance with the maturity level. The result of each maturity level is known as Sum of statements compliance values and calculated by combining the results for each level. The number of maturity statements is the total numbers of statements each maturity level is divided by; for example in Table 6.5: A sample of questionnaire arrangements, the number of maturity statements is 5. The maturity level compliance value is calculated as the average of the compliance level statements. Next, maturity level compliance value is normalized to adjust the values to a common scale. This value is obtained by dividing the maturity level compliance values obtained in the previous step by the total.

Table 6.6 shows an example of calculating the maturity level of a process. Finally, the weighted maturity level is calculated by multiplying the normalized value and maturity level. The algorithm used in this research was adopted by Andrea Pederiva and published in Information System Control Journal (Pederiva, 2003) and illustrated in the next steps:

1. Maturity level compliance value = Summation of statements compliance values / number of maturity level statements
2. Normalize compliance value = Maturity level compliance value / Total of Maturity level compliance value
3. Weighted Maturity level = Normalize compliance value * Maturity level

PO3: Determine Technological Direction							
Management of the process of determining technological direction that satisfies the business requirement for IT of having stable, cost-effective, integrated and standard application systems, resources and capabilities that meet current and future business requirements is:							
Maturity Level	**Statement no.**	**Statements**	**MoE**	**MoI**	**UoB**	**MoH**	**MoW**
0 - Non Existent	1	There is no awareness of the importance of technology infrastructure planning for the entity. How much do you agree?	Not at all	A little	A little	Quite a lot	Not at all
	2	The knowledge and expertise necessary to develop such a technology infrastructure plan do not exist. How much do you agree?	Not at all	Quite a lot	A little	A little	Not at all
	3	There is a lack of understanding that planning for technological change is critical to effectively allocate resources. How much do you agree?	Not at all	Not at all	Quite a lot	Quite a lot	Not at all
1 - Initial/ad Hoc	4	Management recognises the need for technology infrastructure planning. Technology component developments and emerging technology implementations are ad hoc and isolated. How much do you agree?	Completely	A little	Not at all	Quite a lot	Not at all
	5	Technology directions are driven by the often contradictory product evolution plans of hardware, systems software and applications software vendors. Communication of the potential impact of changes in technology is inconsistent. How much do you agree?	Quite a lot	A little	Not at all	A little	A little
2 - Repeatable but Intuitive	6	The need for and importance of technology planning are communicated. Planning is tactical and focused on generating solutions to technical problems, rather than on the use of technology to meet business needs. How much do you agree?	Quite a lot	A little	Not at all	A little	Not at all
	7	Evaluation of technological changes is left to different individuals who follow intuitive, but similar, processes. How much do you agree?	Quite a lot	A little	Not at all	Quite a lot	Not at all
	8	People obtain their skills in technology planning through hands-on learning and repeated application of techniques. How much do you agree?	A little	A little	Not at all	Quite a lot	Quite a lot

Table 6. 5: A sample of questionnaire arrangements

Maturity level	Sum of statements compliance values	Num of maturity level statements	Maturity level compliance value	Normalized compliance value	Weighted Maturity level
0	0.99	3.00	0.33	0.167	0.00
1	0.66	2.00	0.33	0.167	0.17
2	1.32	4.00	0.33	0.167	0.33
3	1.65	5.00	0.33	0.167	0.50
4	2.31	7.00	0.33	0.167	0.67
5	0.99	3.00	0.33	0.167	0.83
Total			1.98	1	2.50

Table 6. 6: An example of calculating the maturity level of a process

Therefore, using the above algorithm (mentioned in steps one to three) for the five case studies, the process maturity level is obtained for 18 processes. For example, the scenario for level 0 is divided into three statements (as shown in the second column). The Excel sheet calculates the statements value for each level (as shown in the first column). The first algorithm for step number 1 is used to calculate the maturity level compliance value. Then the algorithm in step number 2 is used to obtain the normalized compliance value. Finally the weighted maturity level is calculated using the algorithm in step number 3. In the COBIT4.1 framework, the processes are divided into four domains: Plan and Organise, Acquire and Implement, Deliver and Support and finally Monitor and Evaluate. The domain maturity score is determined by its corresponding processes. Since all maturity level results are weighted, the domain maturity is calculated by the average maturity for its processes (as shown in the last column). This is defined as:

> Domain maturity = Summation of corresponding weighted maturity levels / number of its processes

The following section will present IT Governance maturity for the Kingdom of Bahrain and describe the results obtained for the 18 selected processes using the same calculation method and then classify them into strongest and weakest processes.

6.5. Results

This section presents the results of the study. The 18 questionnaires, found in Appendix A, were used to collect the empirical data. The results were obtained by calculating the collected data using a developed tool in Microsoft Excel, as discussed in the previous section. The IT Governance maturity in the Kingdom of Bahrain will be presented in general, and then will be broken down in more detail to represent the IT Governance domains and processes.

The IT Governance in the Kingdom of Bahrain obtained the maturity score 2.75 out of 5.00. This result is shown in a graphical representation by using the COBIT maturity scale, as in Figure 6.4: Graphic Representation of IT Governance Maturity score in Kingdom of Bahrain. According to the COBIT maturity scale, the ITG maturity lays between Repeatable and Intuitive (Level 2) and Defined Process (Level 3), leaning toward the later. The maturity scores for the five case studies presented in Figure 6.5: Maturity scores for the five case studies and show that IT Governance maturity fluctuates between 2.5 and 2.91.

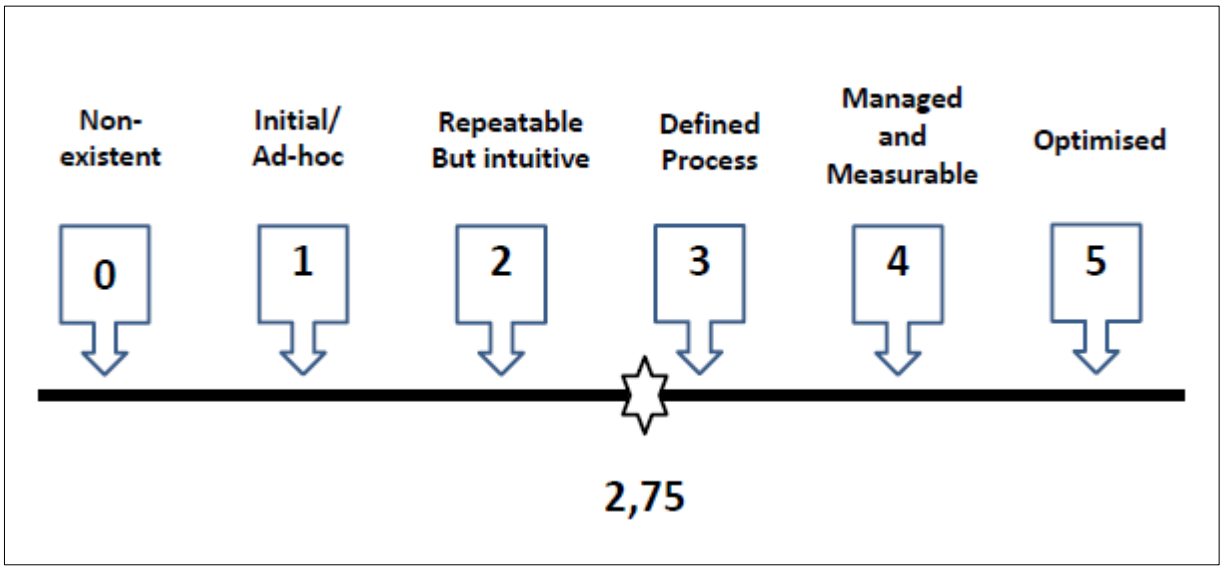


Figure 6. 4: Graphic Representation of IT Governance Maturity score in Kingdom of Bahrain

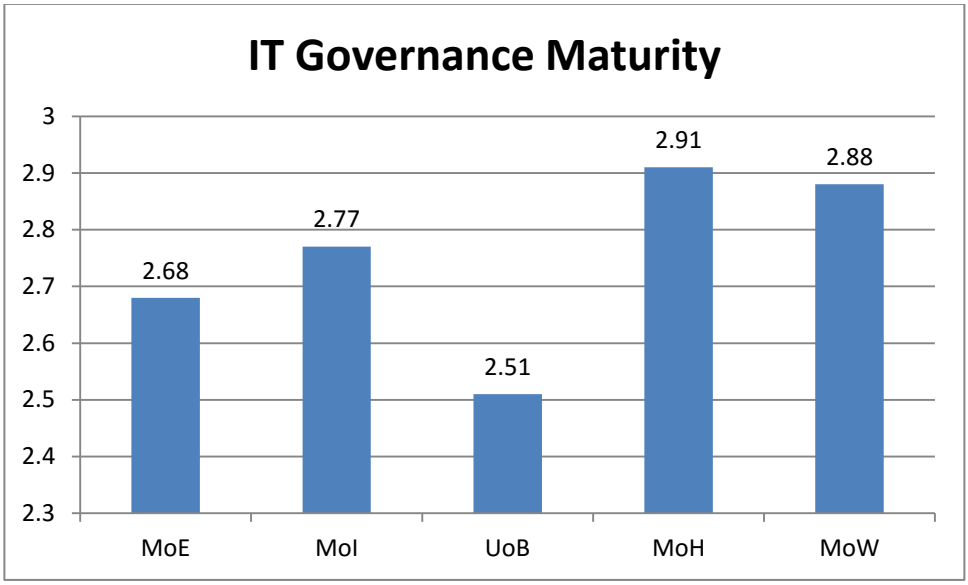


Figure 6. 5: Maturity score for the five case studies

In Figure 6.6: Four domain maturity, these results are further fragmented to domain maturity comparing to the average result to provide a more in-depth view of IT Governance maturity according to the four domains defined by COBIT:

- PO- Plan and Organize
- AI- Acquire and Implement

- DS- Deliver and Support
- ME- Monitor and Evaluate

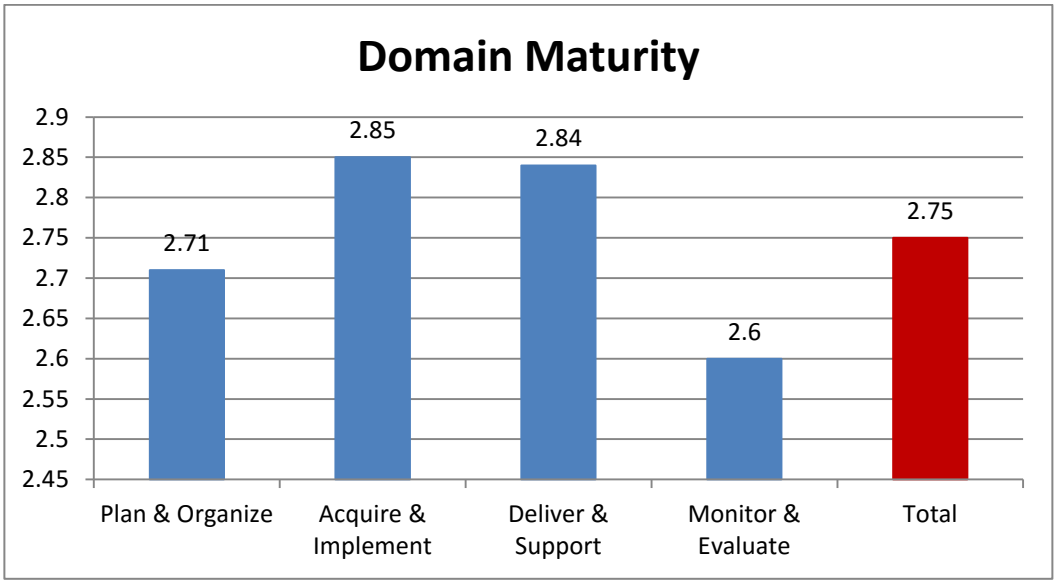


Figure 6. 6: Four Domain Maturity

Domain maturity is calculated by the average of maturity results for its processes and according to the definition shown in Section 6.4: Maturity Calculation. The domain maturity scores in the above chart show that domains are comparatively stable with some minor fluctuations. It is apparent from Figure 6.6: Four domain maturity, that the Acquire and Implement Domain gained the highest maturity score. The score of 2.85 is slightly more than the IT Governance average or total score of 2.75 for the organisations. It can be seen that the next is deliver and support domain which is comparatively similar and not far from the maturity score 2.84. These maturity scores reveal that both domains are reaching maturity level 3 (Defined process). The results also indicate that AI and DS are the strongest domains. The domain Plan and Organize obtained a maturity score of 2.71 which is quite close to the average maturity of 2.75. It is significant that the Monitor and Evaluate domain obtained the lowest maturity of the four domains. The maturity score 2.6 denotes that ME domain is the weakest area in the organisations studied.

The process maturity, illustrated in Figure 6.6: Process Maturity is calculated using the steps illustrated in Section 6.4: Maturity Calculation. The process maturity score will be presented by two methods; the breakdown of the four domains and for each organisation.

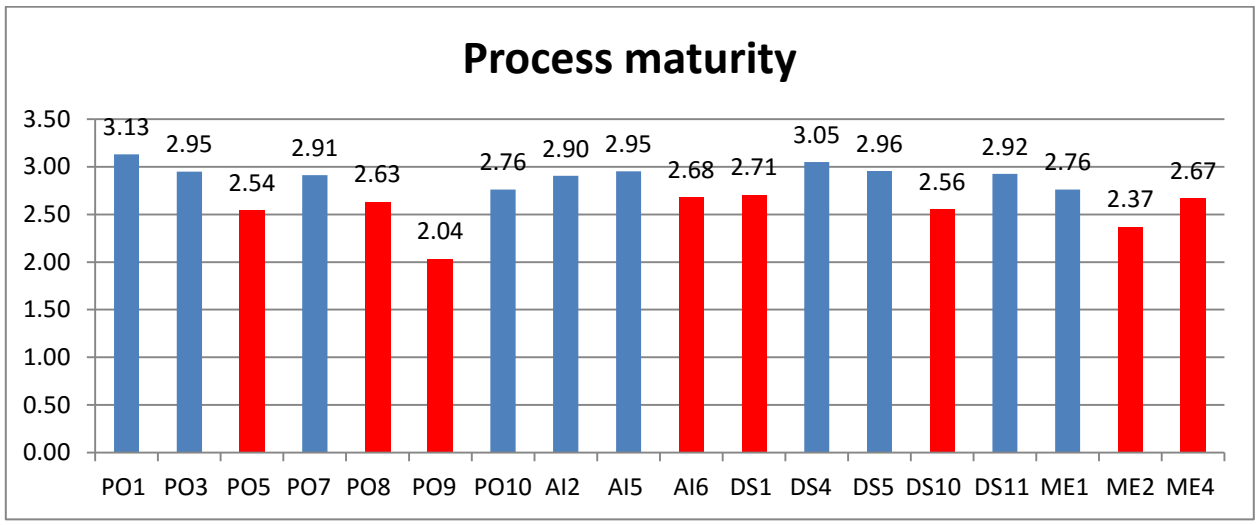


Figure 6.6: Process Maturity

It is apparent from the chart above that there are significant deviations between the maturities of the processes. Most of the process maturity levels fluctuate between 2.00 and 3.5. There are 10 processes out of 18 scoring a maturity level higher than the average 2.75, these are:

- PO1: Define a strategic IT plan
- PO3:Determine technological direction
- PO7: Manage IT human resources
- PO10: Manage projects
- A12: Acquire and maintain application software
- A15: Procure IT resources
- DS4: Ensure continuous services
- DS5: Ensure system security
- DS11: Manage data
- ME1: Monitor and evaluate IT performance

Figure 6.6: Process maturity, also illustrates a comparatively high maturity in the Public Sector Organisations; however the concept of IT Governance was not common because the

researcher found a lack of understanding in the artifacts and enacting force of IT Governance. IT Governance is about decision-making and how to delegate decision rights (this will be further illustrated in Chapter Seven).

The term "process" is a series of actions or changes in order to bring about a result (Akhtar, 2014). For example, processes, like "PO5: Manage the IT investment", "AI6: Manage changes", "DS1: Define and manage service levels" and "ME4: Provide IT governance" obtained scores comparatively close and lower than the average 2.75, while processes like "PO9: Assess and manage IT risks", "DS10: Manage problems" and "ME2: Monitor and evaluate internal controls" obtained particularly low maturity scores. Therefore, this indicates that public organisations require more efforts in being risk-aware organisations and enforcing internal controls and accountability.

The next paragraphs will present the process maturity by the most mature processes, the weakest processes and the breakdown of the five case studies. The findings will be presented by each process, and an overview of the process given along with the collective maturity level results in a bar chart (see Figure 6.6: Process maturity). Each process has a breakdown of the questions in table format (from Table 6.8: Statements for process PO1: Define a strategic IT plan to Table 6.25: Statements for ME4: Provide IT Governance). Each question that is included for each process is then dealt with on an individual basis to ensure a clear view on responses.

6.5.1. Most mature processes

Investigating IT Governance maturity in five case studies revealed significant scores over the average, shown in Figure 6.7: Most mature processes. This section will detail the 10 processes obtaining results over the average of 2.75.

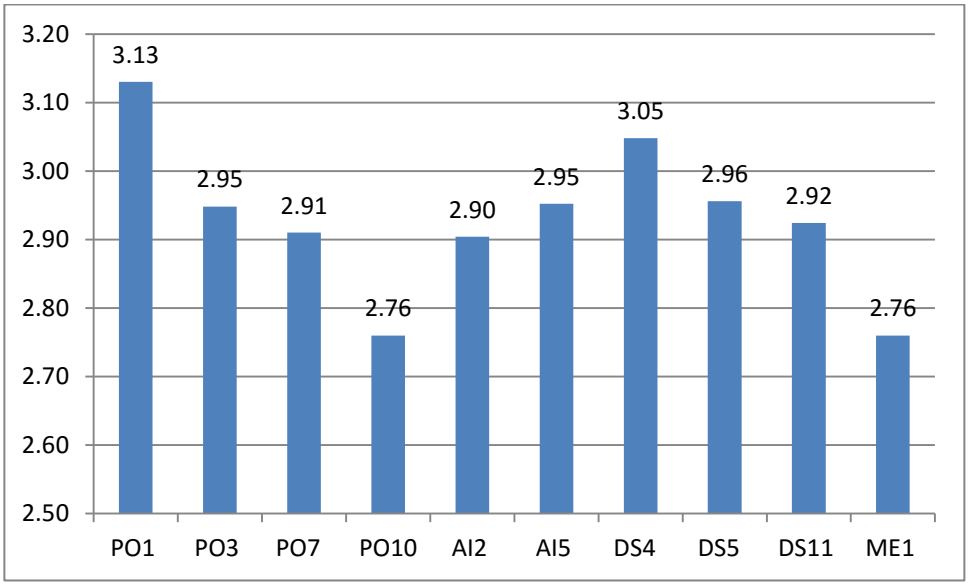


Figure 6.7: Most mature processes

The statements of "PO1: Define a strategic IT plan", were divided into 24 single questions (See Table 6.8: Statements for process PO1: Define a strategic IT plan) and the participants had to choose one answer from; Not at all, A little, Quite a lot or completely (explained in Section 6.4). This process was distributed among 5 IT Directors because the strategic decision rights and plans are assigned and made by the IT Director. The bar chart in Figure 6.8: Maturity Scores for process PO1, shows assessment of the Process PO1 maturity level and presents significant results in four case studies above the average 2.75.

In Figure 6.8: Maturity Scores for process PO1, the cases UoB and MoW have obtained the highest maturity scores. The next highest are cases MoH and MoI, whereas MoE obtained the lowest maturity score at 2.5. As a part of this study, the interviews were conducted with the IT Directorates to obtain a general view of IT Governance maturity and a specific input to the process assigned to them. Accordance with the COBIT maturity model, the results reveal that the organisations with high maturity are between 3 and 4 (with two cases close to 4).

PO1: Define a strategic IT plan

Maturity Level	Statement no.	Statements
0 - Non Existent	1	P01.0: IT strategic planning is not performed. There is no management awareness that IT strategic planning is needed to support business goals. How much do you agree?
1 - Initial/ad Hoc	2	P01.1: The need for IT strategic planning is known by IT management. How much do you agree?
	3	P01.1: IT planning is performed on an as-needed basis in response to a specific business requirement. How much do you agree?
	4	P01.1: IT strategic planning is occasionally discussed at IT management meetings. How much do you agree?
	5	P01.1: The alignment of business requirements, applications and technology takes place reactively rather than by an organisation wide strategy. How much do you agree?
	6	P01.1: The strategic risk position is identified informally on a project-by-project basis. How much do you agree?
2 - Repeatable but Intuitive	7	P01.2: IT strategic planning is shared with business management on an as needed basis. How much do you agree?
	8	P01.2:Updating of the IT plans occurs in response to requests by management. How much do you agree?
	9	P01.2: Strategic decisions are driven on a project-by-project basis without consistency with an overall organisation strategy. How much do you agree?
	10	P01.2: The risks and user benefits of major strategic decisions are recognised in an intuitive way. How much do you agree?
3 - Defined	11	P01.3: A policy defines when and how to perform IT strategic planning. How much do you agree?
	12	P01.3: IT strategic planning follows a structured approach that is documented and known to all staff. How much do you agree?
	13	P01.3: The IT planning process is reasonably sound and ensures that appropriate planning is likely to be performed. How much do you agree?
	14	P01.3: Discretion is given to individual managers with respect to implementation of the process, and there are no procedures to examine the process. How much do you agree?
	15	P01.3: The overall IT strategy includes a consistent definition of risks that the organisation is willing to take as an innovator or follower. How much do you agree?
	16	P01.3: The IT financial, technical and human resources strategies increasingly influence the acquisition of new products and technologies. How much do you agree?
	17	P01.3: IT strategic planning is discussed at business management meetings. How much do you agree?
4 - Managed and Measurable	18	P01.4: IT strategic planning is standard practice and exceptions would be noticed by management. How much do you agree?
	19	P01.4: IT strategic planning is a defined management function with senior-level responsibilities. How much do you agree?
	20	P01.4: Management is able to monitor the IT strategic planning process, make informed decisions based on it and measure its effectiveness. How much do you agree?
	21	P01.4: Both short-range and long-range IT planning occurs and is cascaded down into the organisation, with updates done as needed. How much do you agree?
	22	P01.4:The IT strategy and organisation wide strategy are increasingly becoming more co-ordinated by addressing business processes and value-added capabilities and leveraging the use of applications and technologies through business process re-engineering. How much do you agree?
	23	P01.4:There is a well-defined process for determining the usage of internal and external resources required in system development and operations. How much do you agree?
5 - Optimised	24	P01.5:IT strategic planning is a documented, living process; is continuously considered in business goal setting; and results in discernible business value through investments in IT. How much do you agree?

Table 6. 5: Statements for process PO1: Define a strategic IT plan

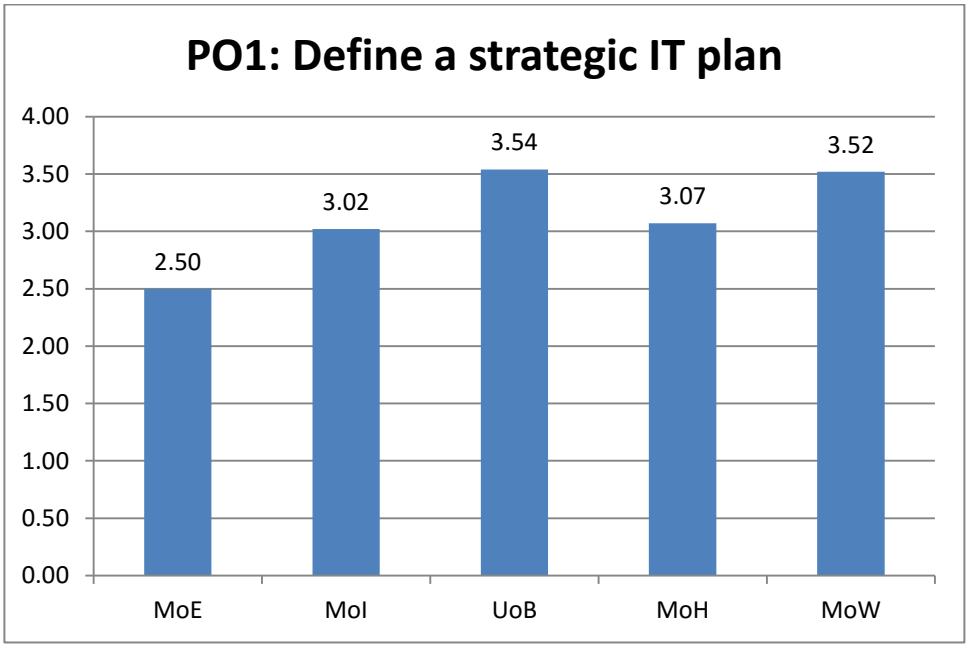


Figure 6.8: Maturity scores for process PO1

Consequently, this implies that the PO1: Define a strategic IT plan process is in a *Defined Process* stage and moving toward *Managed and Measurable*. In these essences, the indication is that:

- IT strategic planning is discussed at meetings and documented.
- Management is able to monitor the IT strategic planning process and make decisions based on it.
- The IT strategy and the organisation wide strategy are integrated.

However, with the organisation's maturity score of 2.5 (indicating that the process is between *Repeatable but Intuitive* and *Defined* process), it was apparent from the data collection stage that this document was not "in place" and was created a few months after the data collection.

PO3: Determine Technological Direction

Maturity Level	Statement no.	Statements
0 - Non Existent	1	There is no awareness of the importance of technology infrastructure planning for the entity. How much do you agree?
	2	The knowledge and expertise necessary to develop such a technology infrastructure plan do not exist. How much do you agree?
	3	There is a lack of understanding that planning for technological change is critical to effectively allocate resources. How much do you agree?
1 - Initial/ad Hoc	4	Management recognises the need for technology infrastructure planning. Technology component developments and emerging technology implementations are ad hoc and isolated. How much do you agree?
	5	Technology directions are driven by the often contradictory product evolution plans of hardware, systems software and applications software vendors. Communication of the potential impact of changes in technology is inconsistent. How much do you agree?
2 - Repeatable but Intuitive	6	The need for and importance of technology planning are communicated. Planning is tactical and focused on generating solutions to technical problems, rather than on the use of technology to meet business needs. How much do you agree?
	7	Evaluation of technological changes is left to different individuals who follow intuitive, but similar, processes. How much do you agree?
	8	People obtain their skills in technology planning through hands-on learning and repeated application of techniques. How much do you agree?
	9	Common techniques and standards are emerging for the development of infrastructure components. How much do you agree?
3 - Defined	10	Management is aware of the importance of the technology infrastructure plan. The technology infrastructure plan development process is reasonably sound and aligned with the IT strategic plan. How much do you agree?
	11	There is a defined, documented and well-communicated technology infrastructure plan, but it is inconsistently applied. How much do you agree?
	12	The technology infrastructure direction includes an understanding of where the organisation wants to lead or lag in the use of technology, based on risks and alignment with the organisation's strategy. How much do you agree?
	13	Key vendors are selected based on the understanding of their long-term technology and product development plans, consistent with the organisation's direction. How much do you agree?
	14	Formal training and communication of roles and responsibilities exist. How much do you agree?
4 - Managed and Measurable	15	Management ensures the development and maintenance of the technology infrastructure plan. How much do you agree?
	16	IT staff members have the expertise and skills necessary to develop a technology infrastructure plan. How much do you agree?
	17	The potential impact of changing and emerging technologies is taken into account. Management can identify deviations from the plan and anticipate problems. How much do you agree?
	18	The human resources strategy is aligned with the technology direction, to ensure that IT staff members can manage technology changes. How much do you agree?
	19	Migration plans for introducing new technologies are defined. How much do you agree?
	20	Outsourcing and partnering are being leveraged to access necessary expertise and skills. How much do you agree?
	21	Management has analysed the acceptance of risk regarding the lead or lag use of technology in developing new business opportunities or operational efficiencies. How much do you agree?
5 - Optimised	22	A research function exists to review emerging and evolving technologies and benchmark the organisation against industry norms. How much do you
	23	The direction of the technology infrastructure plan is guided by industry and international standards and developments, rather than driven by technology
	24	The potential business impact of technological change is reviewed at senior management levels. There is formal executive approval of new and changed

Table 6. 6: Statements for PO3 Determine Technological Direction

The statements of PO3 maturity model definition were divided into 24 single questions (see Table 6.9: Statements for PO3 Determine Technological Direction) and the participant had to choose one answer; Not at all, A little, Quite a lot or Completely (explained in Section 6.4). This process was distributed among 5 IT Directors.

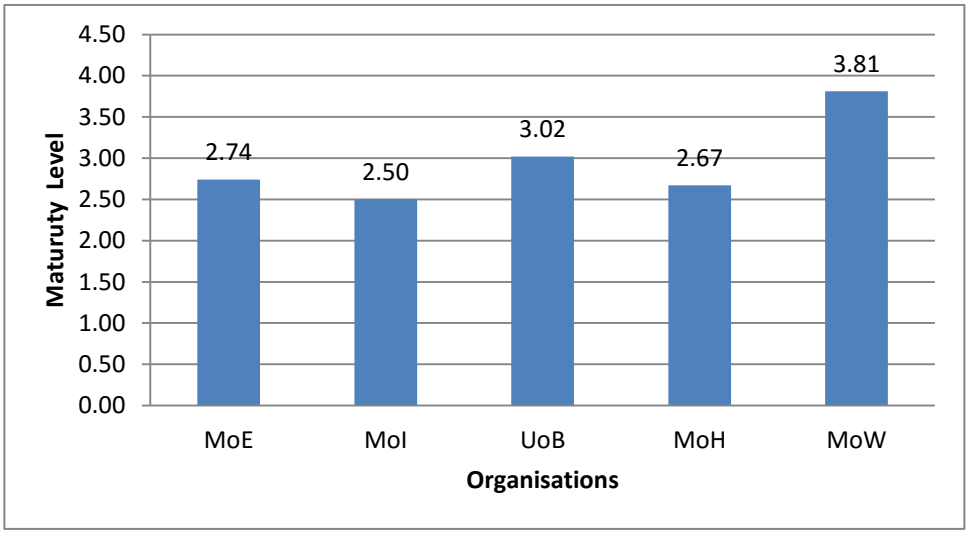


Figure 6.9: PO3 Determine Technological Direction Maturity Results

The bar chart in Figure 6.9: PO3 Determine Technological Direction Maturity Results, determines the assessment results of Process PO3 maturity level and presents only two case studies above the average 2.75 and shows a significant result of 3.81 maturities. One case study obtained quite a lot lower than the average with a maturity result of 2.74. The remaining two cases produced 2.5 and 2.67.

The focus of this process was on IT Directorates to obtain the management view on the technology direction that satisfies the business. Regarding the COBIT maturity model, the results reveal that the organisations with high maturity are between 3 and 4 (with two cases close to 4). Consequently, this implies that the PO1: Define a strategic IT plan process is in a *Defined Process* stage and moving toward *Managed and Measurable*. In these essences, the indication is that:

1. Organisations are aware of the emerging technologies.
2. Organisations are adopting a technology infrastructure plan that is in accordance with the IT strategy.
3. Some organisations adopted a process to monitor the business, legal and regulatory environment.
4. Some organisations adopted a secure technology solution for providing the information and advice.

When mapping the maturity results of the remaining two with the COBIT maturity model, the results indicate that the organisations are in the *Repeatable but Intuitive* stage and almost near *Defined Process.* Both organisations are comparatively very large organisations and are distributed among different geographical locations. The critical time of data collection with the political changes during this period had an impact on regulations and consequently on plans and individuals. The management are aware of the overall issue. It was noted that the organisations are depending on some key individuals, who have expertise, without sharing this knowledge in any form of documentation of the policies and procedures. The training is provided as a response to a need to know rather than on the basis of an agreed plan. The control of the distributed Centres or Directors among different locations requires definite responsibilities and accountabilities especially when problems occur and a culture of blame tends to exist.

PO7: Manage the IT Human Resources

Maturity Level	Statement no.	Statements
0 - Non Existent	1	There is no awareness about the importance of aligning IT human resources management with the technology planning process for the organisation. How much do you agree?
	2	There is no person or group formally responsible for IT human resources management. How much do you agree?
1 - Initial/ad Hoc	3	Management recognises the need for IT human resources management. The IT human resources management process is informal and reactive. How much do you agree?
	4	The IT human resources process is operationally focused on the hiring and managing of IT personnel. How much do you agree?
	5	Awareness is developing concerning the impact that rapid business and technology changes and increasingly complex solutions have on the need for new skills and competence levels. How much do you agree?
2 Repeatable but Intuitive	6	There is a tactical approach to hiring and managing IT personnel, driven by project-specific needs, rather than by an understood balance of internal and external availability of skilled staff. How much do you agree?
	7	Informal training takes place for new personnel, who then receive training on an as-required basis. How much do you agree?
3 - Defined	8	There is a defined and documented process for managing IT human resources. How much do you agree?
	9	An IT human resources management plan exists. How much do you agree?
	10	There is a strategic approach to hiring and managing IT personnel. How much do you agree?
	11	A formal training plan is designed to meet the needs of IT human resources. How much do you agree?
	12	A rotational programme, designed to expand technical and business management skills, is established. How much do you agree?
4 - Managed and Measurable	13	Responsibility for the development and maintenance of an IT human resources management plan is assigned to a specific individual or group with the requisite expertise and skills necessary to develop and maintain the plan. How much do you agree?
	14	The process of developing and managing the IT human resources management plan is responsive to change. How much do you agree?
	15	Standardised measures exist in the organisation to allow it to identify deviations from the IT human resources management plan, with specific emphasis on managing IT personnel growth and turnover. How much do you agree?
	16	Compensation and performance reviews are being established and compared to other IT organisations and industry good practice. How much do you agree?
	17	IT human resources management is proactive, taking into account career path development. How much do you agree?
5 - Optimised	18	The IT human resources management plan is continuously being updated to meet changing business requirements. How much do you agree?
	19	IT human resources management is integrated with technology planning, ensuring optimum development and use of available IT skills. How much do you agree?
	20	The IT human resources management is integrated with and responsive to the entity's strategic direction. How much do you agree?
	21	Components of IT human resources management are consistent with industry good practices, such as compensation, performance reviews, participation in industry forums, transfer of knowledge, training and mentoring. How much do you agree?
	22	Training programmes are developed for all new technology standards and products prior to their deployment in the organisation. How much do you agree?

Table 6. 7: Statements for PO7 Manage the IT Human Resources

The statements of PO7 maturity model definition were divided into 22 single questions and the participant had to choose one answer: Not at all, A little, Quite a lot and completely, shown in Table 6.10: Statements for PO7 Manage the IT Human Resources. The process was distributed among the Chief of a section, Head of a group or department and senior specialist or analyst. The bar chart presents the assessment results for process PO7: Manage the IT Human Resources; as in Figure 6.10: PO7: Manage IT Human Resources Maturity results.

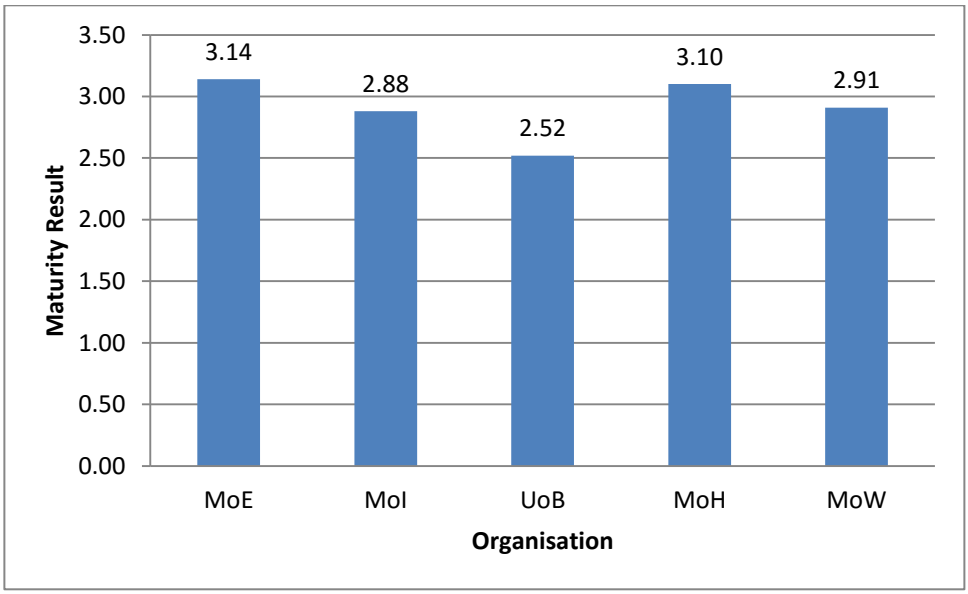


Figure 6.10: PO7: Manage IT Human Resources Maturity results

Four case studies obtained results higher than the average 2.75. This indicates that the four organisations are in the *Defined Process* or near this maturity level. This is evidence that Public organisations maintain recruitment processes in line with the organisations' policies and procedures. The recruitment of IT personnel is regularly verifying the competency that fulfils their roles on the basis of education, training and experience. However, it has been noted that training is still based on individual initiatives in some cases.

It is common that a case obtains a maturity result of 2.52, which indicates that the organisation is in the *Repeatable but Intuitive* stage and heading to *Defined Process.* The organisation is adopting a tactical plan to manage and hire IT personnel. The training plan is shaped to meet the IT human resources needs and the existing skills.

In general, it has been also noted that organisations in the public sector mostly depend upon key individuals who sometimes capture the knowledge without planning for staff backup and knowledge transfer arrangements. In terms of the regular performance evaluation, which is conducted on a regular basis, some organisations do not provide the coaching to employees on their performance.

P10: Manage Projects

Maturity Level	Statement no.	Statements
0 - Non Existent	1	Project management techniques are not used and the organisation does not consider business impacts associated with project mismanagement and development project failures. How much do you agree?
1 - Initial/ad Hoc	2	The use of project management techniques and approaches within IT is a decision left to individual IT managers. How much do you agree?
	3	There is a lack of management commitment to project ownership and project management. How much do you agree?
	4	Critical decisions on project management are made without user management or customer input. How much do you agree?
	5	There is little or no customer and user involvement in defining IT projects. How much do you agree?
	6	There is no clear organisation within IT for the management of projects. How much do you agree?
	7	Roles and responsibilities for the management of projects are not defined. How much do you agree?
	8	Projects, schedules and milestones are poorly defined, if at all. How much do you agree?
	9	Project staff time and expenses are not tracked and compared to budgets. How much do you agree?
2 Repeatable but Intuitive	10	Senior management gains and communicates an awareness of the need for IT project management. How much do you agree?
	11	The organisation is in the process of developing and utilising some techniques and methods from project to project. How much do you agree?
	12	IT projects have informally defined business and technical objectives. How much do you agree?
	13	There is limited stakeholder involvement in IT project management. How much do you agree?
	14	Initial guidelines are developed for many aspects of project management. How much do you agree?
	15	Application of project management guidelines is left to the discretion of the individual project manager. How much do you agree?
3 - Defined	16	The IT project management process and methodology are established and communicated. How much do you agree?
	17	IT projects are defined with appropriate business and technical objectives. How much do you agree?
	18	Senior IT and business management are beginning to be committed and involved in the management of IT projects. How much do you agree?
	19	A project management office is established within IT, with initial roles and responsibilities defined. How much do you agree?
	20	IT projects are monitored, with defined and updated milestones, schedules, budget and performance measurements. How much do you agree?
	21	Project management training is available and is primarily a result of individual staff initiatives. How much do you agree?
	22	QA procedures and post-system implementation activities are defined, but are not broadly applied by IT managers. How much do you agree?
4 - Managed and Measurable	23	Management requires formal and standardised project metrics and lessons learned to be reviewed following project completion. How much do you agree?
	24	Project management is measured and evaluated throughout the organisation and not just within IT. How much do you agree?
	25	Enhancements to the project management process are formalised and communicated with project team members trained on enhancements. How much do you agree?
	26	IT management implements a project organisation structure with documented roles, responsibilities and staff performance criteria. How much do you agree?
	27	Criteria for evaluating success at each milestone are established. Value and risk are measured and managed prior to, during and after the completion of projects. How much do you agree?
	28	Projects increasingly address organisation goals, rather than only IT-specific ones. How much do you agree?
	29	There is strong and active project support from senior management sponsors as well as stakeholders. How much do you agree?
	30	Relevant project management training is planned for staff in the project management office and across the IT function. How much do you agree?
5 - Optimised	31	A proven, full life cycle project and programme methodology is implemented, enforced and integrated into the culture of the entire organisation. An ongoing initiative to identify and institutionalise best project management practices is implemented. How much do you agree?
	32	An IT strategy for sourcing development and operational projects is defined and implemented. How much do you agree?
	33	An integrated project management office is responsible for projects and programmes from inception to post-implementation. How much do you agree?
	34	Organisation wide planning of programmes and projects ensures that user and IT resources are best utilised to support strategic initiatives. How much do you agree?

Table 6. 8: Statements for PO10 Manage Projects

The statements of P10 maturity model definition were divided into 34 single questions, shown in Table 6.11: Statements for PO10 Manage Projects. The process was distributed among Vice President, Chief of a section, Head of a group or department, senior specialist and specialist. A bar chart was used to determine the relationship between maturity levels. Figure 6.11: PO10 Manage Projects Maturity Results, shows assessment of the maturity level and illustrates two results below average and the remaining three above average. The Figure shows three case studies above the average of 2.75 and shows a significant maturity result of 3.72. Two case studies obtained a comparatively low maturity with 1.88 and 1.93.

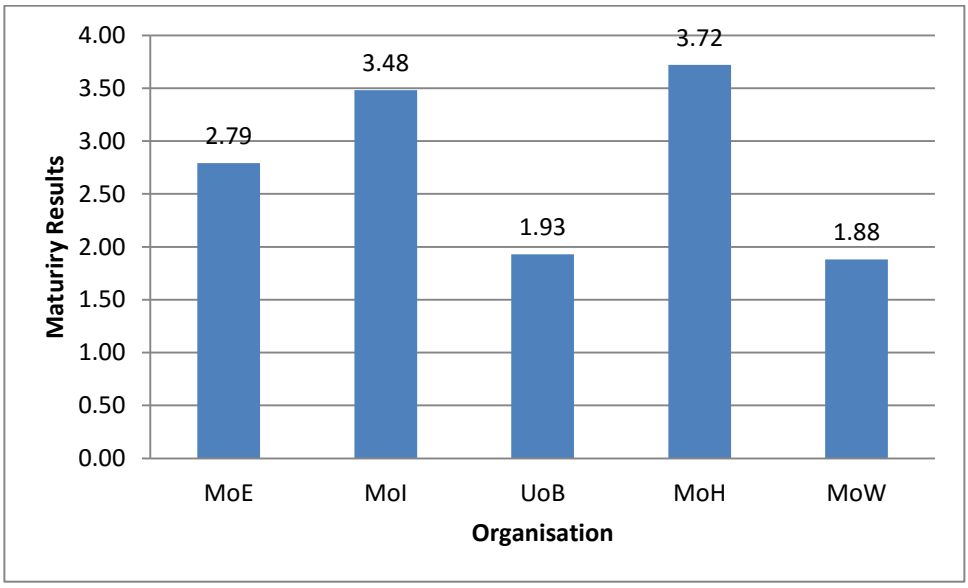


Figure 6.11: PO10 Manage Projects Maturity Results

Indeed, two organisations obtained maturity results of 3.48 and 3.72. These results are mapped into the COBIT maturity model and indicate that these organisations are in the *Defined Process* and toward the *Managed and Measurable* stage. In this process, a project management office (PMO) plays a critical role in tracking and controlling the cost/time mechanisms.

The IT project management process is communicated and training is available. Projects are becoming more standardised and lessons learned from completed projects are considered. However, one organisation obtained a maturity result of 2.79 and when mapping to the

COBIT maturity model showed that the organisation is in the *Repeatable but Intuitive* and almost near the *Defined Process*. This is due to establishing this new concept of the PMO. Yet, the PMO is more accountable in this process than the IT Directorate who is accountable for establishing the IT project management framework.

Two organizations obtained 1.88 and 1.93 and these are apparently very low. Regarding the COBIT maturity model, the organisations are in the *Initial* stage and heading almost to the *Repeatable but Intuitive* stage. These are striking results as noted from the empirical investigation that one of the organisations is adopting a dedicated official PMO office (MoW) compared to (UoB). It has been noted that there is still a need for clear roles and responsibilities for the management of projects.

AI2: Acquire and Maintain Application Software

Maturity Level	Statement no.	Statements
0 - Non Existent	1	There is no process for designing and specifying applications. How much do you agree?
	2	Typically, applications are obtained based on vendor-driven offerings, brand recognition or IT staff familiarity with specific products, with little or no consideration of actual requirements. How much do you agree?
1 - Initial/ad Hoc	3	There is awareness that a process for acquiring and maintaining applications is required. How much do you agree?
	4	Approaches to acquiring and maintaining application software vary from project to project. How much do you agree?
	5	Some individual solutions to particular business requirements are likely to have been acquired independently, resulting in inefficiencies with maintenance and support. How much do you agree?
2 Repeatable but Intuitive	6	There are different, but similar, processes for acquiring and maintaining applications based on the expertise within the IT function. How much do you agree?
	7	The success rate with applications depends greatly on the in-house skills and experience levels within IT. How much do you agree?
	8	Maintenance is usually problematic and suffers when internal knowledge is lost from the organisation. How much do you agree?
	9	There is little consideration of application security and availability in the design or acquisition of application software. How much do you agree?
3 – Defined	10	A clear, defined and generally understood process exists for the acquisition and maintenance of application software. How much do you agree?
	11	This process is aligned with IT and business strategy. How much do you agree?
	12	An attempt is made to apply the documented processes consistently across different applications and projects. How much do you agree?
	13	The methodologies are generally inflexible and difficult to apply in all cases, so steps are likely to be bypassed. How much do you agree?
	14	Maintenance activities are planned, scheduled and co-ordinated. How much do you agree?
4 - Managed and Measurable	15	There is a formal and well-understood methodology that includes a design and specification process, criteria for acquisition, a process for testing and requirements for documentation. How much do you agree?
	16	Documented and agreed-upon approval mechanisms exist to ensure that all steps are followed and exceptions are authorised. How much do you agree?
	17	Practices and procedures evolve and are well suited to the organisation, used by all staff and applicable to most application requirements. How much do you agree?
5 – Optimised	18	Application software acquisition and maintenance practices are aligned with the defined process. How much do you agree?
	19	The approach is component based, with predefined, standardised applications matched to business needs. How much do you agree?
	20	The approach is enterprise wide. How much do you agree?
	21	The acquisition and maintenance methodology is well advanced and enables rapid deployment, allowing for high responsiveness and flexibility in responding to changing business requirements. How much do you agree?
	22	The application software acquisition and implementation methodology is subjected to continuous improvement and is supported by internal and external knowledge databases containing reference materials and good practices. How much do you agree?
	23	The methodology creates documentation in a predefined structure that makes production and maintenance efficient. How much do you agree?

Table 6. 9: Statements for A12 Acquire and Maintain Application Software

The statements of AI2 maturity model definition were divided into 23 single questions and the participants had to choose one answer, shown in Table 6.12: Statements for A12 Acquire and Maintain Application Software. The process was distributed among Head of a group or department, senior specialist, Administrator, designer and programmer. A bar chart was used to determine the relationship between maturity levels. Figure 6.12 A12 Acquire and Maintain Application Software Maturity Results, shows the assessment of the maturity levels and illustrates that results fluctuate between 2.44 and 3.46.

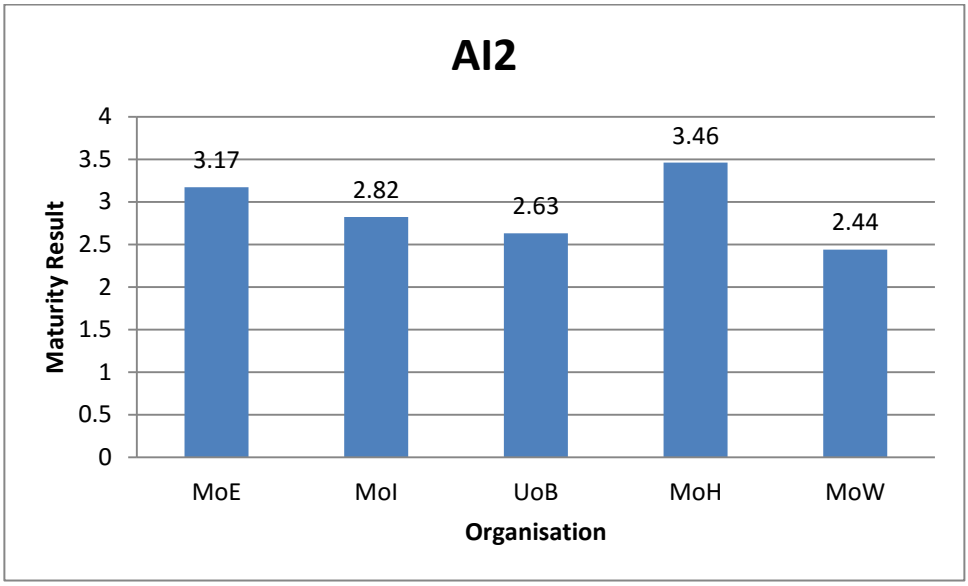


Figure 6.12: A12 Acquire and Maintain Application Software Maturity Results

The bar chart above shows three cases above the average with maturity results of 2.82, 3.17 and 3.46. The remaining two organisations obtained comparatively less maturity at 2.63 and 2.44. Mapping these results into the COBIT maturity model indicates that organisations with higher than the average are near *Managed and Measurable* and reveals that the organisations defined a plan for standardising tools and still cannot monitor critical activities. The organisations lower than the average were in the *Repeatable but Intuitive*. The correlation of these results to practice provides a conclusion that: the tools are available, but might be based on solutions developed by an individual or solutions acquired are probably not applied correctly.

The more surprising result was in the case (MoW) where significant attention to adopt applications and methodologies to meet the business requirements was noted compared to the other four case studies.

AI5: Procure IT Resources

Maturity Level	Statement no.	Statements
0 - Non Existent	1	There is no defined IT resource procurement process in place. How much do you agree?
	2	The organisation does not recognise the need for clear procurement policies and procedures to ensure that all IT resources are available in a timely and cost-efficient manner. How much do you agree?
1 - Initial/ad Hoc	3	The organisation recognises the need to have documented policies and procedures that link IT acquisition to the business organisation's overall procurement process. How much do you agree?
	4	Contracts for the acquisition of IT resources are developed and managed by project managers and other individuals exercising their professional judgement rather than as a result of formal procedures and policies. How much do you agree?
	5	There is only an ad hoc relationship between corporate acquisition and contract management processes and IT. How much do you agree?
	6	Contracts for acquisition are managed at the conclusion of projects rather than on a continuous basis. How much do you agree?
2 Repeatable but Intuitive	7	There is organisational awareness of the need to have basic policies and procedures for IT acquisition. How much do you agree?
	8	Policies and procedures are partially integrated with the business organisation's overall procurement process. How much do you agree?
	9	Procurement processes are mostly utilised for large and highly visible projects. How much do you agree?
	10	Responsibilities and accountabilities for IT procurement and contract management are determined by the individual contract manager's experience. How much do you agree?
	11	The importance of supplier management and relationship management is recognised; however, it is addressed based on individual initiative. How much do you agree?
	12	Contract processes are mostly utilised by large or highly visible projects. How much do you agree?
3 – Defined	13	Management institutes policies and procedures for IT acquisition. How much do you agree?
	14	Policies and procedures are guided by the business organisation's overall procurement process. How much do you agree?
	15	IT acquisition is largely integrated with overall business procurement systems. How much do you agree?
	16	IT standards for the acquisition of IT resources exist. How much do you agree?
	17	Suppliers of IT resources are integrated into the organisation's project management mechanisms from a contract management perspective. How much do you agree?
	18	IT management communicates the need for appropriate acquisitions and contract management throughout the IT function. How much do you agree?
4 - Managed and Measurable	19	IT acquisition is fully integrated with overall business procurement systems. How much do you agree?
	20	IT standards for the acquisition of IT resources are used for all procurements. How much do you agree?
	21	Measurements on contract and procurement management are taken relevant to the business cases for IT acquisition. How much do you agree?
	22	Reporting on IT acquisition activity that supports business objectives is available. How much do you agree?
	23	Management is usually aware of exceptions to the policies and procedures for IT acquisition. How much do you agree?
	24	Strategic management of relationships is developing. How much do you agree?
	25	IT management enforces the use of the acquisition and contract management process for all acquisitions by reviewing performance measurement. How much do you agree?
5 – Optimised	26	Management institutes resources' procurement thorough processes for IT acquisition. How much do you agree?
	27	Management enforces compliance with policies and procedures for IT acquisition. How much do you agree?
	28	Measurements on contract and procurement management are taken that are relevant to the business cases for IT acquisitions. How much do you agree?
	29	Good relationships are established over time with most suppliers and partners, and the quality of relationships is measured and monitored. How much do you agree?
	30	Relationships are managed strategically. IT standards, policies and procedures for the acquisition of IT resources are managed strategically and respond to measurement of the process. How much do you agree?
	31	IT management communicates the strategic importance of appropriate acquisition and contract management throughout the IT function. How much do you agree?

Table 6. 10: Statements for AI5: Procure IT Resources

The statements of AI5 maturity model definition were divided into 31 single questions, shown in Table 6.13: Statements for AI5: Procure IT Resources. This process has been distributed among Chief of Section, Head of a group or department, Senior specialist and Analyst. A bar chart is used to determine the relationship between maturity levels. Figure 6.13: AI5 Procure IT Resources Maturity Results, shows the assessment results and illustrates that they fluctuate between 2.56 and 3.37.

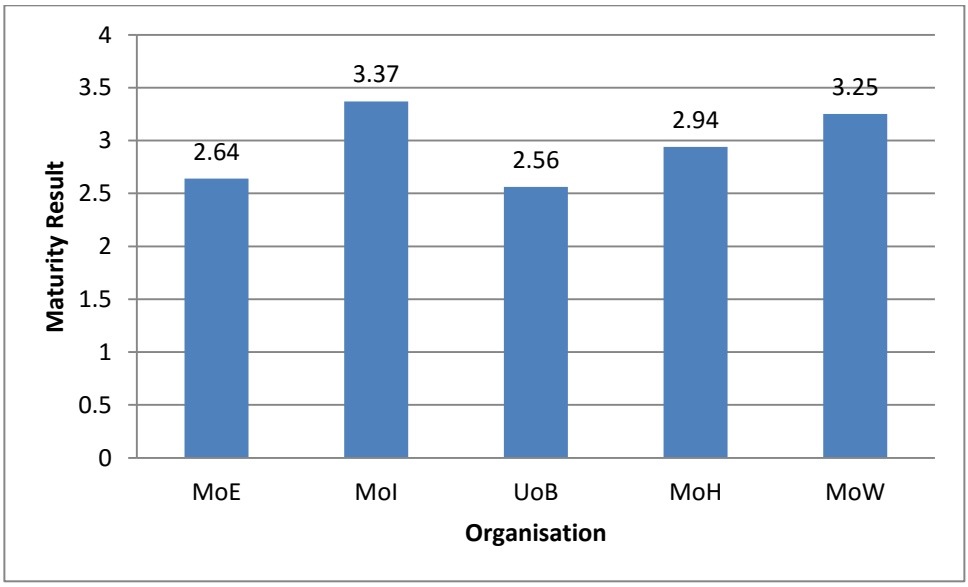


Figure 6. 13: AI5 Procure IT Resources Maturity Results

This process measured whether the organisation adopts procedures for procuring IT resources, including people, hardware, software and services needing to be procured. This covers the selection of venders and contractual arrangements ensuring cost-effectiveness and in a timely manner. The Figure above illustrates that the maturities are in between *Repeatable but Intuitive* stage and *Managed and Measurable* according to the COBIT Maturity Model. Three organisations obtained results above the average.

A possible explanation for this might be that organisations are having the necessary awareness and have clear guidance of procuring policies and procedures, however they were not documented in some cases. The contract process management needs further review and control to satisfy the stakeholders.

DS4: Ensure Continuous Service

Maturity Level	Statement no.	Statements
Level 0	1	There is no understanding of the risks, vulnerabilities and threats to IT operations or the impact of loss of IT services to the business. How much do you agree?
	2	Service continuity is not considered to need management attention. How much do you agree?
1 - Initial/ad Hoc	3	Responsibilities for continuous service are informal, and the authority to execute responsibilities is limited. How much do you agree?
	4	Management is becoming aware of the risks related to and the need for continuous service. How much do you agree?
	5	The focus of management attention on continuous service is on infrastructure resources, rather than on the IT services. How much do you agree?
	6	Users implement workarounds in response to disruptions of services. How much do you agree?
	7	The response of IT to major disruptions is reactive and unprepared. How much do you agree?
	8	Planned outages are scheduled to meet IT needs but do not consider business requirements. How much do you agree?
2 Repeatable but Intuitive	9	Responsibility for ensuring continuous service is assigned. How much do you agree?
	10	The approaches to ensuring continuous service are fragmented. How much do you agree?
	11	Reporting on system availability is sporadic, may be incomplete and does not take business impact into account. How much do you agree?
	12	There is no documented IT continuity plan, although there is commitment to continuous service availability and its major principles are known. How much do you agree?
	13	An inventory of critical systems and components exists, but it may not be reliable. How much do you agree?
	14	Continuous service practices are emerging, but success relies on individuals. How much do you agree?
3 - Defined	15	Accountability for the management of continuous service is unambiguous. How much do you agree?
	16	Responsibilities for continuous service planning and testing are clearly defined and assigned. How much do you agree?
	17	The IT continuity plan is documented and based on system criticality and business impact. How much do you agree?
	18	There is periodic reporting of continuous service testing. How much do you agree?
	19	Individuals take the initiative for following standards and receiving training to deal with major incidents or a disaster. How much do you agree?
	20	High-availability components and system redundancy are being applied. How much do you agree?
	21	An inventory of critical systems and components is maintained. How much do you agree?
4 - Managed and Measurable	22	Responsibilities and standards for continuous service are enforced. The responsibility to maintain the continuous service plan is assigned. How much do you agree?
	23	Maintenance activities are based on the results of continuous service testing, internal good practices, and the changing IT and business environment. How much do you agree?
	24	Structured data about continuous service are being gathered, analysed, reported and acted upon. How much do you agree?
	25	Formal and mandatory training is provided on continuous service processes. How much do you agree?
	26	System availability good practices are being consistently deployed. How much do you agree?
	27	Availability practices and continuous service planning influence each other. How much do you agree?
	28	Discontinuity incidents are classified, and the increasing escalation path for each is well known to all involved. How much do you agree?
	29	IT Goals and metrics for continuous service have been developed and agreed upon but may be inconsistently measured. How much do you agree?
5 - Optimised	30	Integrated continuous service processes take into account benchmarking and best external practices. How much do you agree?
	31	The IT continuity plan is integrated with the business continuity plans and is routinely maintained. How much do you agree?
	32	The requirement for ensuring continuous service is secured from vendors and major suppliers. How much do you agree?
	33	Global testing of the IT continuity plan occurs, and test results are input for updating the plan. How much do you agree?
	34	Management ensures that a disaster or major incident will not occur as a result of a single point of failure. How much do you agree?

Table 6.11: Statements for DS4: Ensure Continuous Service

The statements of the DS4 maturity model definition were divided into 34 single questions, shown in Table 6.14: Statements for DS4: Ensure Continuous Service. The process was distributed among the IT Director, Chief, Head, Senior specialist and Analyst. A bar chart was used to determine the relationship between maturity levels. Figure 6.14: DS4 Ensure Continuous Service Maturity Results, shows the assessment of the maturity levels and illustrates that results fluctuate between 2.84 and 3.49.

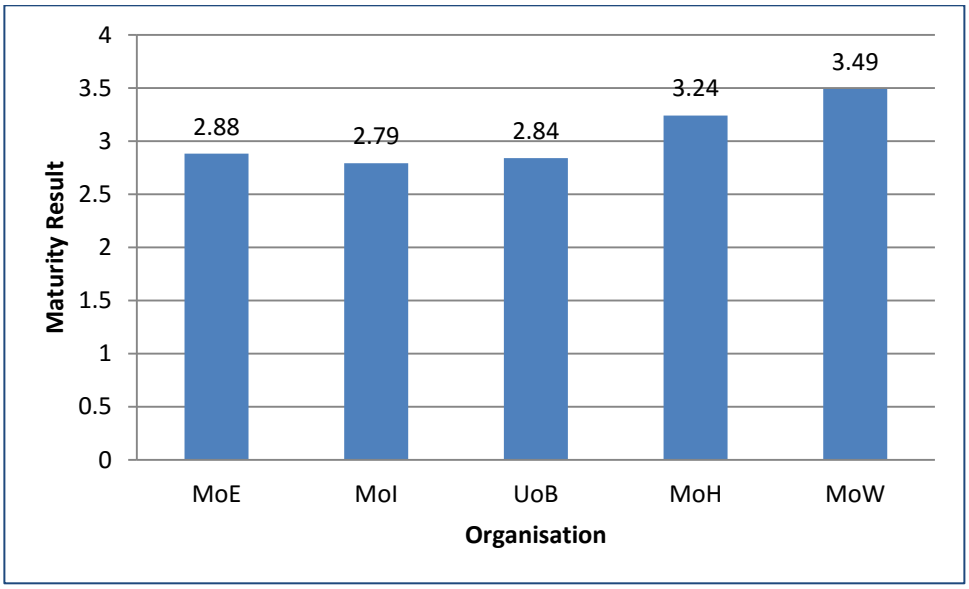


Figure 6.14: DS4 Ensure Continuous Service Maturity Results

The process tackled an important topic for organisations within the public sectors. The statements assessed whether the organisations are maintaining an IT contingency plan and understand the probability of IT Service interruption on key business functions. From the data in Figure 6.13, it is apparent that all results are above the average of 2.75. These indicate that the results obtained are between the *Repeatable but Intuitive* and heading to the *Managed and Measurable* stage. Organisations, such as MoW and MoH, obtained significant results compared to the remaining three organisations. There are several possible explanations for this result. IT service is the core of the business function; therefore, the organisations provide a help desk service 24/7 with dedicated trained staff. Calls to these service desks are recorded automatically and resolved according to predefined policies and procedures.

Another possible explanation for this is that the structure of the IT Directorate demonstrates the distribution of different roles and responsibilities. This is important in defining the owner of the process and the authority assigned. Consequently, this leads to accepting the accountability culture when an interruption to key business services occurs.

DS5: Ensure Systems Security

Maturity Level	Statement no.	Statements
0 - Non Existent	1	The organisation does not recognise the need for IT security. How much do you agree?
	2	Responsibilities and accountabilities are not assigned for ensuring security. How much do you agree?
	3	Measures supporting the management of IT security are not implemented. How much do you agree?
	4	There is no IT security reporting and no response process for IT security breaches. How much do you agree?
	5	There is a complete lack of a recognisable system security administration process. How much do you agree?
1 - Initial/ad Hoc	6	The organisation recognises the need for IT security. How much do you agree?
	7	Awareness of the need for security depends primarily on the individual. How much do you agree?
	8	IT security is addressed on a reactive basis. How much do you agree?
	9	IT security is not measured. Detected IT security breaches invoke finger-pointing responses, because responsibilities are unclear. How much do you agree?
	10	Responses to IT security breaches are unpredictable. How much do you agree?
2 Repeatable but Intuitive	11	Responsibilities and accountabilities for IT security are assigned to an IT security co-ordinator, although the management authority of the co-ordinator is limited. How much do you agree?
	12	Awareness of the need for security is fragmented and limited. How much do you agree?
	13	Although security-relevant information is produced by systems, it is not analysed. How much do you agree?
	14	Services from third parties may not address the specific security needs of the organisation. How much do you agree?
	15	Security policies are being developed, but skills and tools are inadequate. How much do you agree?
	16	IT security reporting is incomplete, misleading or not pertinent. How much do you agree?
	17	Security training is available but is undertaken primarily at the initiative of the individual. How much do you agree?
	18	IT security is seen primarily as the responsibility and domain of IT and the business does not see IT security as within its domain. How much do you agree?
3 - Defined	19	Security awareness exists and is promoted by management. How much do you agree?
	20	IT security procedures are defined and aligned with IT security policy. How much do you agree?
	21	Responsibilities for IT security are assigned and understood, but not consistently enforced. How much do you agree?
	22	An IT security plan and security solutions exist as driven by risk analysis. How much do you agree?
	23	Reporting on security does not contain a clear business focus. How much do you agree?
	24	Ad hoc security testing (e.g., intrusion testing) is performed. How much do you agree?
	25	Security training is available for IT and the business, but is only informally scheduled and managed. How much do you agree?
4 - Managed and Measurable	26	Responsibilities for IT security are clearly assigned, managed and enforced. How much do you agree?
	27	IT security risk and impact analysis is consistently performed. How much do you agree?
	28	Security policies and procedures are completed with specific security baselines. How much do you agree?
	29	Exposure to methods for promoting security awareness is mandatory. How much do you agree?
	30	User identification, authentication and authorisation are standardised. How much do you agree?
	31	Security certification is pursued for staff members who are responsible for the audit and management of security. How much do you agree?
	32	Security testing is completed using standard and formalised processes, leading to improvements of security levels. How much do you agree?
	33	IT security processes are co-ordinated with an overall organisation security function. IT security reporting is linked to business objectives. How much do you agree?
	34	IT security training is conducted in both the business and IT. IT security training is planned and managed in a manner that responds to business needs and defined security risk profiles. How much do you agree?

Maturity Level	Statement no.	Statements
5 - Optimised	35	IT security is a joint responsibility of business and IT management and is integrated with corporate security business objectives. How much do you agree?
	36	IT security requirements are clearly defined, optimised and included in an approved security plan. How much do you agree?
	37	Users and customers are increasingly accountable for defining security requirements, and security functions are integrated with applications at the design stage. How much do you agree?
	38	Security incidents are promptly addressed with formalised incident response procedures supported by automated tools. How much do you agree?
	39	Periodic security assessments are conducted to evaluate the effectiveness of the implementation of the security plan. Information on threats and vulnerabilities is systematically collected and analysed. How much do you agree?
	40	Adequate controls to mitigate risks are promptly communicated and implemented. How much do you agree?
	41	Security testing, root cause analysis of security incidents and proactive identification of risk are used for continuous process improvements. How much do you agree?
	42	Security processes and technologies are integrated organisation wide. How much do you agree?
	43	Metrics for security management are measured, collected and communicated. Management uses these measures to adjust the security plan in a continuous improvement process. How much do you agree?

Table 6. 12: Statements for DS5 Ensure Systems Security

The statements of DS5 maturity model definition were divided into 43 single questions, shown in Table 6.15: Statements for DS5 Ensure Systems Security. The process distributed among Head of a group or department, Senior specialist, Analyst and Programmer. The bar chart in Figure 6.15: DS5 Ensure Systems Security Maturity Results is used to present the assessment results for the five case studies.

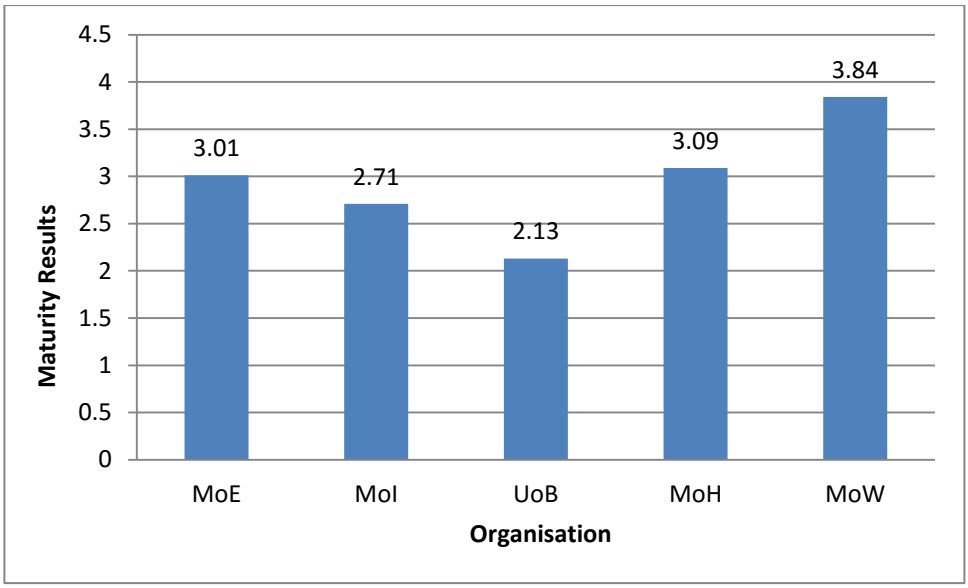


Figure 6.15: DS5 Ensure Systems Security Maturity Results

The process seeks to identify the integrity of information and IT assets. This includes establishing a security plan within definite roles and responsibilities, policy, standards, procedures and security monitoring techniques. The bar chart illustrated in Figure 6.14 shows that the studied organisations obtained results fluctuating between 2.13 and 3.84. When mapping these results to the COBIT Maturity Model, it is apparent that the maturities are in *Repeatable but Intuitive* stage and near the *Managed and Measurable* stage. The significant maturity result is at 3.84 for the case (MoW) and with the observations during the data collection a clear understanding of the security requirements and vulnerabilities, managing user identities and authorisations in a standard manner was shown.

DS11: Manage Data

Maturity Level	Statement no.	Statements
0 - Non Existent	1	Data are not recognised as corporate resources and assets. How much do you agree?
	2	There is no assigned data ownership or individual accountability for data management. How much do you agree?
	3	Data quality and security are poor or non-existent. How much do you agree?
1 - Initial/ad Hoc	4	The organisation recognises a need for effective data management. How much do you agree?
	5	There is an ad hoc approach for specifying security requirements for data management, but no formal communications procedures are in place. How much do you agree?
	6	No specific training on data management takes place. How much do you agree?
	7	Responsibility for data management is not clear. How much do you agree?
	8	Backup/restoration procedures and disposal arrangements are in place. How much do you agree?
2 Repeatable but Intuitive	9	The awareness of the need for effective data management exists throughout the organisation. How much do you agree?
	10	Data ownership at a high level begins to occur. How much do you agree?
	11	Security requirements for data management are documented by key individuals. How much do you agree?
	12	Some monitoring within IT is performed on data management key activities (e.g., backup, restoration, disposal). How much do you agree?
	13	Responsibilities for data management are informally assigned for key IT staff members. How much do you agree?
3 - Defined	14	The need for data management within IT and across the organisation is understood and accepted. How much do you agree?
	15	Responsibility for data management is established. Data ownership is assigned to the responsible party who controls integrity and security. How much do you agree?
	16	Data management procedures are formalised within IT, and some tools for backup/restoration and disposal of equipment are used. How much do you agree?
	17	Some monitoring over data management is in place. Basic performance metrics are defined. How much do you agree?
	18	Training for data management staff members is emerging. How much do you agree?
4 - Managed and Measurable	19	The need for data management is understood, and required actions are accepted within the organisation. How much do you agree?
	20	Responsibility for data ownership and management are clearly defined, assigned and communicated within the organisation. Procedures are formalised and widely known, and knowledge is shared. Usage of current tools is emerging. How much do you agree?
	21	Goal and performance indicators are agreed to with customers and monitored through a well-defined process. How much do you agree?
	22	Formal training for data management staff members is in place. How much do you agree?
5 - Optimised	23	The need for data management and the understanding of all required actions is understood and accepted within the organisation. How much do you agree?
	24	The responsibilities for data ownership and data management are clearly established, widely known across the organisation and updated on a timely basis. How much do you agree?
	25	Procedures are formalised and widely known, and knowledge sharing is standard practice. How much do you agree?
	26	Sophisticated tools are used with maximum automation of data management. How much do you agree?
	27	Goal and performance indicators are agreed to with customers, linked to business objectives and consistently monitored using a well-defined process. How much do you agree?

Table 6. 13: Statements for DS5 Ensure Systems Security

The statements of DS11 maturity model definition were divided into 27 single questions and participants had to choose one answer: Not at all, A little, Quite a lot and completely, shown in Table 6.16: Statements for DS5 Ensure Systems Security**.** The process was distributed among Chief of Section, Head of a group or department, Senior Specialist, Analyst and Programmer.

Figure 6.16: DS5 Ensure Systems Security Maturity Results, shows that the assessment results fluctuate between 2.70 and 3.11.The process concerns the management of the soft side of IT assets and includes effective procedures for backups, disposals and recovery of data. Comparing the results illustrated in Figure 6.16: DS5 Ensure Systems Security Maturity Results, to the COBIT Maturity Model reveals that the maturities are between the *Repeatable and Intuitive* stage and *Defined Process* stage. This is evidence that the organisations are securing the availability of data to meet the business requirements.

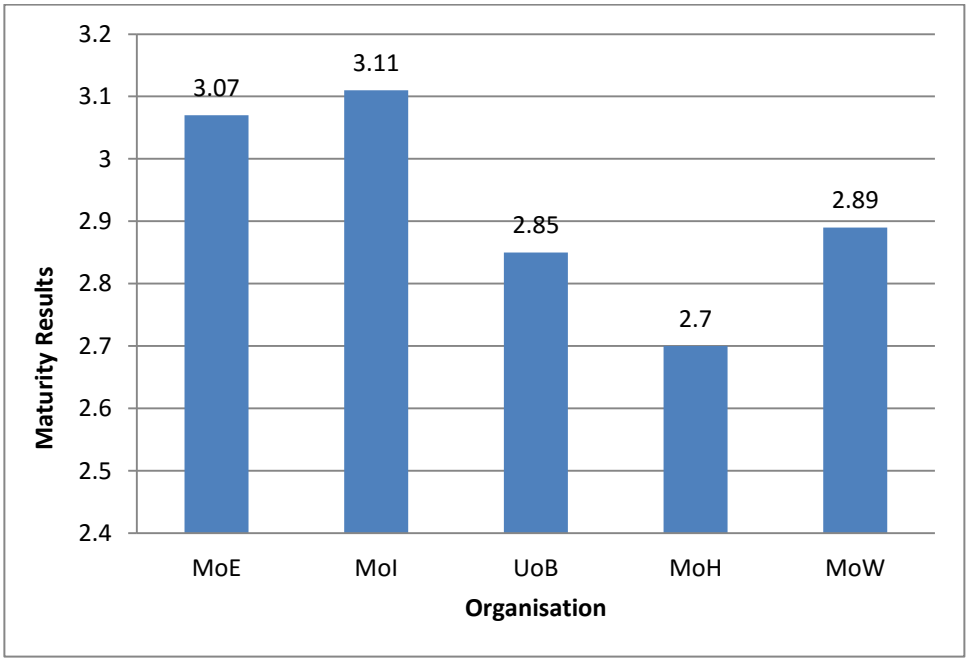


Figure 6.16: DS5 Ensure Systems Security Maturity Results

ME1: Monitor and Evaluate IT Performance

Maturity Level	Statement no.	Statements
0 - Non Existent	1	The organisation has no monitoring process implemented. How much do you agree?
	2	IT does not independently perform monitoring of projects or processes. How much do you agree?
	3	Useful, timely and accurate reports are not available. How much do you agree?
	4	The need for clearly understood process objectives is not recognised. How much do you agree?
1 - Initial/ad Hoc	5	Management recognises a need to collect and assess information about monitoring processes. How much do you agree?
	6	Standard collection and assessment processes have not been identified. How much do you agree?
	7	Monitoring is implemented and metrics are chosen on a case-by-case basis, according to the needs of specific IT projects and processes. How much do you agree?
	8	Monitoring is generally implemented reactively to an incident that has caused some loss or embarrassment to the organisation. How much do you agree?
2 Repeatable but Intuitive	9	Basic measurements to be monitored are identified. How much do you agree?
	10	Collection and assessment methods and techniques exist, but the processes are not adopted across the entire organisation. How much do you agree?
	11	Interpretation of monitoring results is based on the expertise of key individuals. How much do you agree?
	12	Limited tools are chosen and implemented for gathering information, but the gathering is not based on a planned approach. How much do you agree?
3 - Defined	13	Management communicates and institutes standard monitoring processes. How much do you agree?
	14	Educational and training programmes for monitoring are implemented. How much do you agree?
	15	A formalised knowledge base of historical performance information is developed. How much do you agree?
	16	Assessment is still performed at the individual IT process and project level and is not integrated amongst all processes. How much do you agree?
	17	Measurements of the contribution of the information services function to the performance of the organisation are defined, using traditional financial and operational criteria. How much do you agree?
	18	IT-specific performance measurements, non-financial measurements, strategic measurements, customer satisfaction measurements and service levels are defined. How much do you agree?
	19	A framework is defined for measuring performance. How much do you agree?
4 - Managed and Measurable	20	Management defines the tolerances under which processes must operate. Reporting of monitoring results is being standardised and normalised. How much do you agree?
	21	There is integration of metrics across all IT projects and processes. The IT organisation's management reporting systems are formalised. How much do you agree?
	22	Automated tools are integrated and leveraged organisation wide to collect and monitor operational information on applications, systems and processes. How much do you agree?
	23	Management is able to evaluate performance based on agreed-upon criteria approved by stakeholders. How much do you agree?
	24	Measurements of the IT function align with organisation wide goals. How much do you agree?
5 - Optimised	25	A continuous quality improvement process is developed for updating organisation wide monitoring standards and policies and incorporating industry good practices. How much do you agree?
	26	All monitoring processes are optimised and support organisation wide objectives. How much do you agree?
	27	Business driven metrics are routinely used to measure performance and are integrated into strategic assessment frameworks, such as the IT balanced scorecard. How much do you agree?
	28	Process monitoring and ongoing redesign are consistent with organisation wide business process improvement plans. How much do you agree?

Table 6.14: Statements for ME1: Monitor and Evaluate IT Performance

The statements of ME1 maturity model definition were divided into 28 single questions and participants had to choose one answer: Not at all, A little, Quite a lot and Completely, shown in Table 6.17: Statements for ME1: Monitor and Evaluate IT Performance. The process was distributed among IT Directors and Chief of Sections. A bar chart is used to determine the relationship between maturity levels. Figure 6.17: ME1 Monitor and Evaluate IT Performance Maturity Results, shows the assessment of the levels and illustrates that results fluctuate between 2.10 and 3.29.

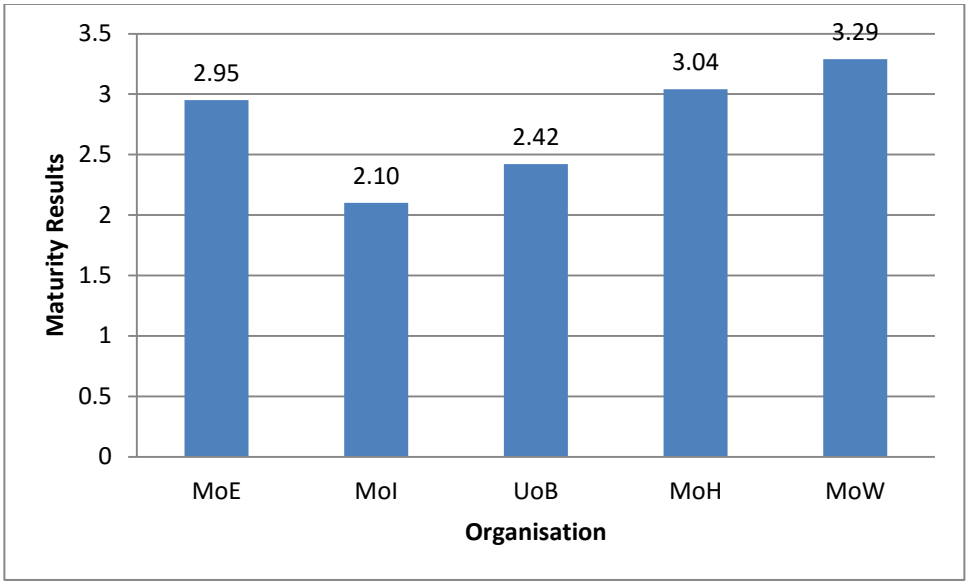


Figure 6.17: ME1 Monitor and Evaluate IT Performance Maturity Results

The process measures the monitoring of IT performance and includes collating the performance reports into management reports while defining targets and remedial actions. The results obtained indicate that the three organisations obtained scores above the average. It is also apparent that the maturities reside between the *Repeatable but Intuitive* stage and *Defined Process* stage in correlation with the COBIT Maturity Model.

The observations from the empirical investigation showed clear attention given to cost-saving and customer satisfaction criteria. However, a need to revise service level agreements to place some additional governance requirements was noted.

6.5.2. The weakest processes

The research will now focus on understanding the weakest processes to identify the gaps within IT Governance Practice in the public sector and therefore discover the recommendations to bridge or mind these gaps. The processes shown to have the least maturity procedures are shown in Figure 6.18.

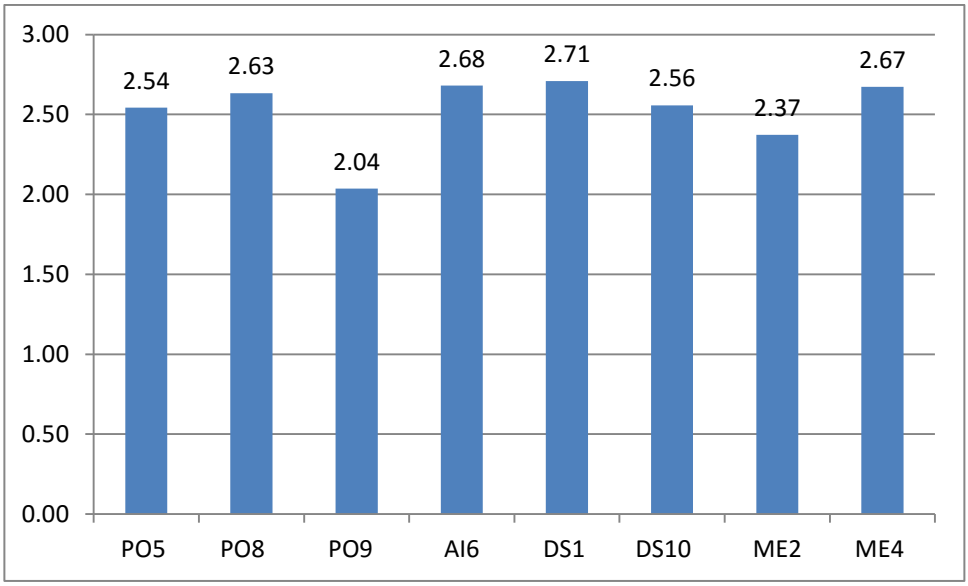


Figure 6.18: Weakest Maturity Processes

The details of eight processes will be illustrated in the next paragraphs. Statements for each process, results for each organisation and existing weaknesses will be presented. Further discussions will be expressed in Chapter Seven: Discussions and Research Findings.

PO5: Manage the IT investment

Maturity Level	Statement no.	Statements
0 - Non Existent	1	There is no awareness of the importance of IT investment selection and budgeting. How much do you agree?
	2	There is no tracking or monitoring of IT investments and expenditures. How much do you agree?
1 - Initial/ad Hoc	3	The organisation recognises the need for managing the IT investment, but this need is communicated inconsistently. Allocation of responsibility for IT investment selection and budget development is done on an ad hoc basis. How much do you agree?
	4	Isolated implementations of IT investment selection and budgeting occur, with informal documentation. IT investments are justified on an ad hoc basis. How much do you agree?
2 Repeatable but Intuitive	5	There is an implicit understanding of the need for IT investment selection and budgeting. The need for a selection and budgeting process is communicated. How much do you agree?
	6	Compliance is dependent on the initiative of individuals in the organisation. How much do you agree?
	7	There is an emergence of common techniques to develop components of the IT budget. Reactive and tactical budgeting decisions occur. How much do you agree?
3 - Defined	8	Policies and processes for investment and budgeting are defined, documented and communicated, and cover key business and technology issues. How much do you agree?
	9	The IT budget is aligned with the strategic IT and business plans. The budgeting and IT investment selection processes are formalised documented and communicated. How much do you agree?
	10	Formal training is emerging but is still based primarily on individual initiatives. Formal approval of IT investment selections and budgets is taking place. How much do you agree?
	11	IT staff members have the expertise and skills necessary to develop the IT budget and recommend appropriate IT investments. How much do you agree?
4 - Managed and Measurable	12	Responsibility and accountability for investment selection and budgeting are assigned to a specific individual. Budget variances are identified and resolved. How much do you agree?
	13	Formal costing analysis is performed, covering direct and indirect costs of existing operations, as well as proposed investments, considering all costs over a total life cycle. How much do you agree?
	14	A proactive and standardised process for budgeting is used. How much do you agree?
	15	The impact of shifting in development and operating costs from hardware and software to systems integration and IT human resources is recognised in the investment plans. How much do you agree?
	16	Benefits and returns are calculated in financial and non-financial terms. How much do you agree?
5 - Optimised	17	Industry good practices are used to benchmark costs and identify approaches to increase the effectiveness of investments. How much do you agree?
	18	Analysis of technological developments is used in the investment selection and budgeting process. How much do you agree?
	19	The investment management process is continuously improved based on lessons learned from the analysis of actual investment performance. How much do you agree?
	20	Investment decisions incorporate price/performance improvement trends. How much do you agree?
	21	Funding alternatives are formally investigated and evaluated within the context of the organisation's existing capital structure, using formal evaluation methods. How much do you agree?
	22	An analysis of the long-term cost and benefits of the total life cycle is incorporated in the investment decisions. How much do you agree?

Table 6.15: Statements for PO5 Manage the IT investment

The statements of PO5 maturity model definition were divided into 22 single questions, shown in Table 6.18: Statements for PO5 Manage the IT investment. The process was distributed among 5 IT Directors. The bar chart in Figure 6.19: PO5 Manage the IT investment Maturity Results, shows the assessment of Process PO5 and presents two significant results above the average and the remaining three below.

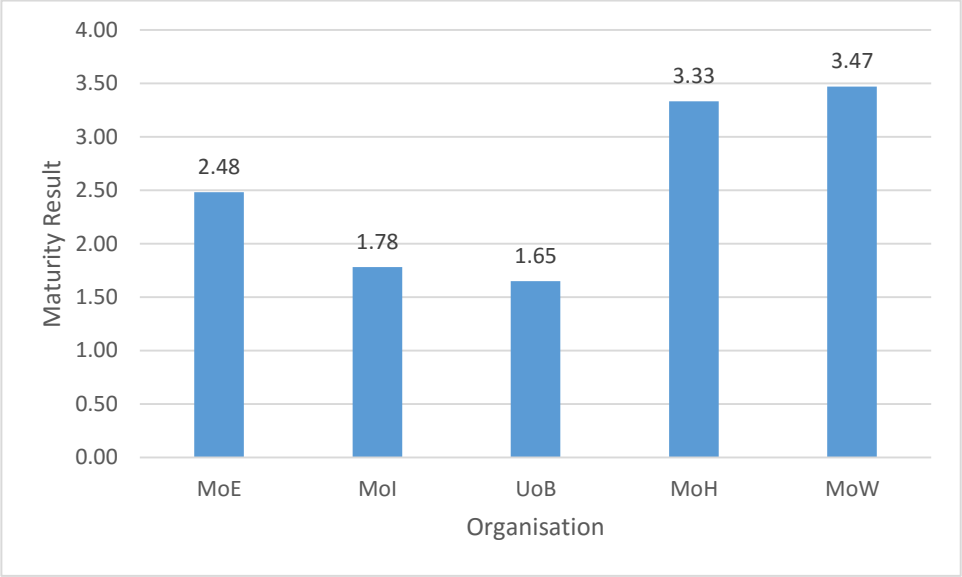


Figure 6.19: PO5 Manage the IT investment Maturity Results

This process measured if organisations are maintaining a framework to manage IT programs within a formal budgeting process. Figure 6.19: PO5 Manage the IT investment Maturity Results, determines that maturities fluctuate between 1.65 and 3.47. When mapping these results on the COBIT maturity model, it is apparent that the maturity is between *Initial* stage and defined stage. From this data, we can see that two organisations are heading to the *Managed and Measurable* level.

IT investment management in Public Organisations remains critical to demonstrate IT cost-efficiency, contribution to the business and satisfying end-users expectations. It is important to bear in mind what return on investment (ROI) criteria are emerging in the public sector. Strong evidence was found in response to question 2, shown in Figure 6.18; the majority

(60%) of the responses answered positively with “Completely” in case there isn’t a tracking or monitoring of IT investment and expenditure. Twenty percent believed “A little”, whereas the remaining 20% of responses said “Not at all”, as can be seen in Figure 6.20: Responses to PO5 Question 2.

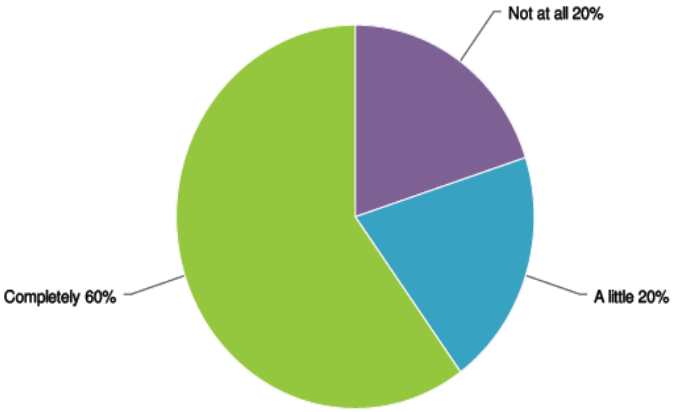


Figure 6.20: Responses to PO5 Question 2

Another positive correlation was found in Question 3, where the majority of the respondents (60%) indicated with “A little” measuring if the organization recognizes the need for managing the IT investment, but this need is communicated inconsistently and 40% of the respondents said “Quite a lot”, as can be seen in Figure 6.21: Responses to PO5 Question.

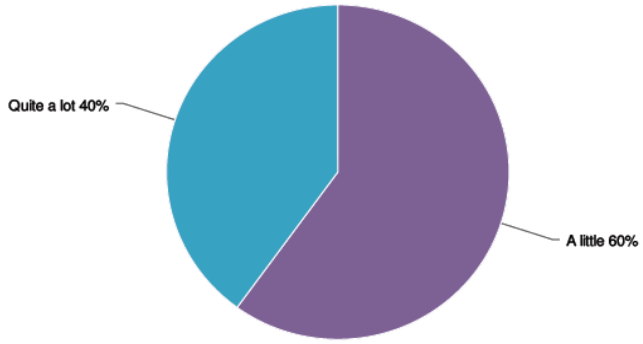


Figure 6.21: Responses to PO5 Question 3

The observation from Question 7 shows that the majority of the respondents said “A little”, for there is an emergence of common techniques to develop components of the IT budget and reactive budgeting decisions occur. Twenty percent of the respondents said “Not at all”, whereas the remaining 20% said “Completely”, as can be seen in Figure 6.22: Responses to P05 Question 7.

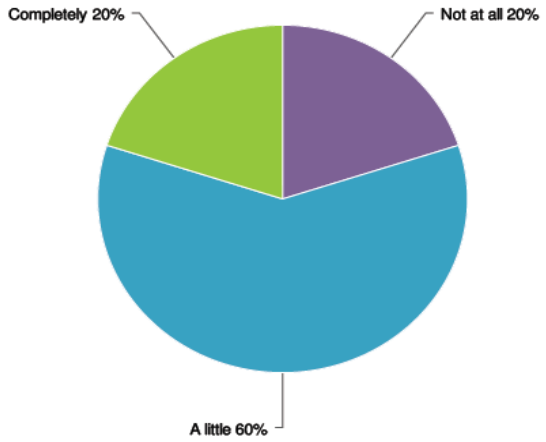


Figure 6.22: Responses to P05 Question 7

PO8: Manage Quality

Maturity Level	Statement no.	Statements
0 – Non Existent	1	The organisation lacks a QMS planning process and a system development life cycle (SDLC) methodology. How much do you agree?
	2	Senior management and IT staff members do not recognise that a quality programme is necessary. How much do you agree?
	3	Projects and operations are never reviewed for quality. How much do you agree?
1 – Initial/ad Hoc	4	There is a management awareness of the need for a QMS. How much do you agree?
	5	The QMS is driven by individuals where it takes place. How much do you agree?
	6	Management makes informal judgements on quality. How much do you agree?
2 – Repeatable but Intuitive	7	A programme is being established to define and monitor QMS activities within IT. How much do you agree?
	8	QMS activities that do occur are focused on IT project- and process-oriented initiatives, not on organisationwide processes. How much do you agree?
3 – Defined	9	A defined QMS process is communicated throughout the enterprise by management and involves IT and end-user management. How much do you agree?
	10	An education and training programme is emerging to teach all levels of the organisation about quality. How much do you agree?
	11	Basic quality expectations are defined and are shared amongst projects and within the IT organisation. How much do you agree?
	12	Common tools and practices for quality management are emerging. How much do you agree?
	13	Quality satisfaction surveys are planned and occasionally conducted. How much do you agree?
4 – Managed and Measurable	14	The QMS is addressed in all processes, including processes with reliance on third parties. How much do you agree?
	15	A standardised knowledge base is being established for quality metrics. Cost-benefit analysis methods are used to justify QMS initiatives. How much do you agree?
	16	Cost-benefit analysis methods are used to justify QMS initiatives. How much do you agree?
	17	Benchmarking against the industry and competitors is emerging. How much do you agree?
	18	An education and training programme is instituted to teach all levels of the organisation about quality. How much do you agree?
	19	Tools and practices are being standardised, and root cause analysis is periodically applied. How much do you agree?
	20	Quality satisfaction surveys are consistently conducted. How much do you agree?
	21	A standardised programme for measuring quality is in place and well structured. IT management is building a knowledge base for quality metrics. How much do you agree?
5 – Optimised	22	The QMS is integrated and enforced in all IT activities. How much do you agree?
	23	QMS processes are flexible and adaptable to changes in the IT environment. How much do you agree?
	24	The knowledge base for quality metrics is enhanced with external good practices. How much do you agree?
	25	Benchmarking against external standards is routinely performed. How much do you agree?
	26	Quality satisfaction surveying is an ongoing process and leads to root cause analysis and improvement actions. How much do you agree?

Table 6.16: Statements for PO8 Manage Quality

The statements of PO8 maturity model definition were divided into 26 single questions, shown in Table 6.19: Statements for PO8 Manage Quality. The process was distributed among Vice President, Chief of a section, Head of a group or department and Specialist or Analyst. The process measures the status of providing clear quality requirements and policies. This should be communicated and monitored to ensure that IT is delivering value to the business and stakeholders.

The bar chart in Figure 6.23: PO8 Manage Quality Maturity Results, shows the maturity levels and illustrates results comparatively between the scales 2.30 and 3.20. When mapping the results obtained to the COBIT maturity model they reside between *Repeatable but Intuitive* level and *Defined Process*. Two organisations obtained results above the average.

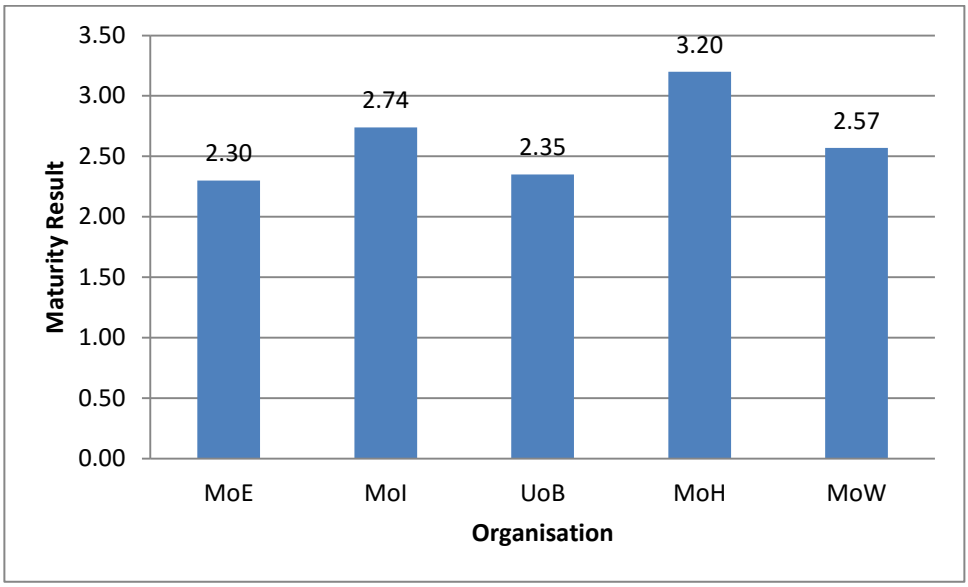


Figure 6.23: PO8 Manage Quality Maturity Results

Further analysis on the responses between the maturities levels 2 and 3 reveals some significant observations. In Question 1, the results show that 50% of the respondents said "A little" regarding the organization lacking a QMS planning process and a system development life cycle (SDLC) methodology, 10% said "Not at all", 30% said "Quite a lot" and 10% said "Completely", as can be seen in Figure 6.24: Responses to PO8 Manage Quality Question 1.

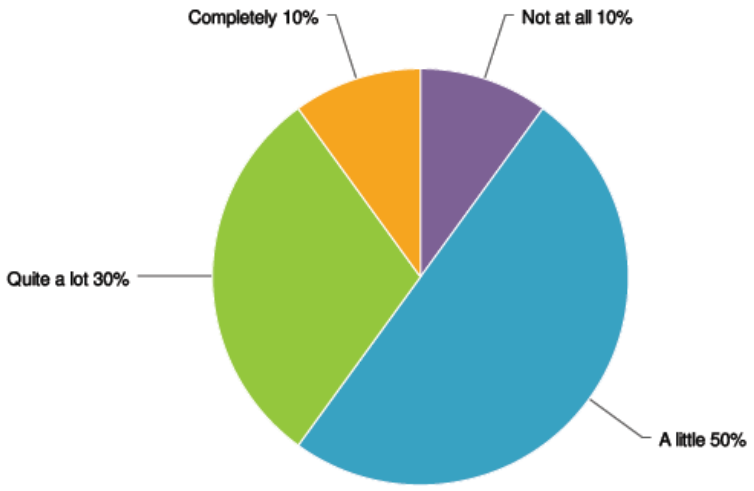


Figure 6.24: Responses to PO8 Manage Quality Question 1

In Question 3, 20% of the respondents said "Not at all", 40% said "A little" for the question asking if projects and operations are never reviewed for quality, whereas the remaining 30% said "Quite a lot" and 10% said " Completely", as can be seen in Figure 6.25: Responses to PO8 Manage Quality Question 3 .

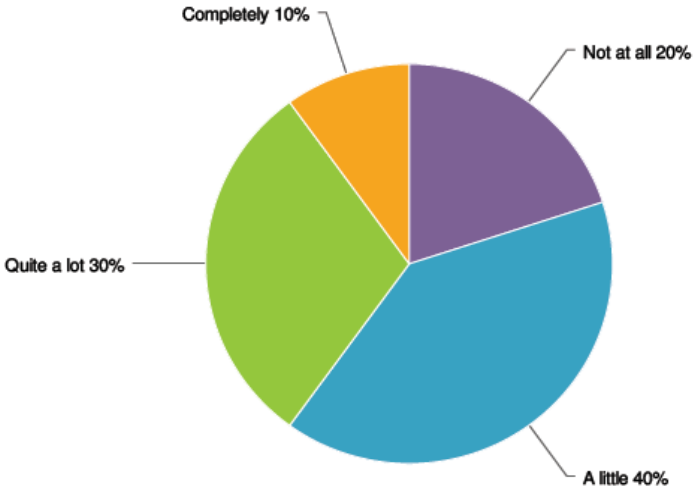


Figure 6.25: Responses to PO8 Manage Quality Question 3

The results in Question 6 shows that the majority of the respondents said “A little” for assessing if the management makes informal judgments on quality, whereas only 20% said “Quite a lot”, 10% said “Completely” and only 10% said “Not at all”, as can be seen in Figure 6.26: Responses to PO8 Manage Quality Question 6.

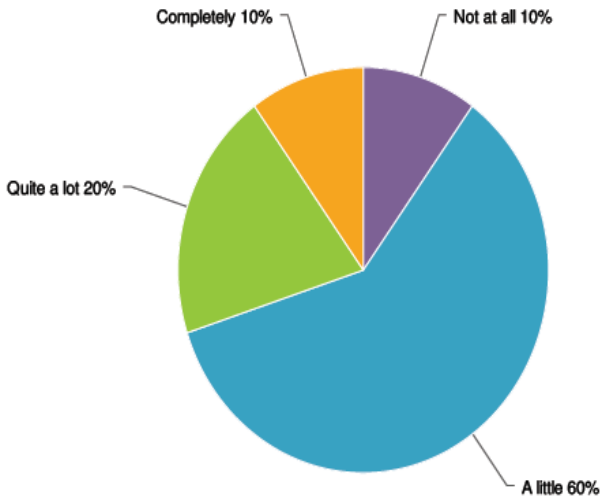


Figure 6.26: Responses to PO8 Manage Quality Question 6

In Question 10, the results show that only 20% of the respondents said “Completely” for the question assessing if an education and training programme is emerging to teach all levels of the organization about quality, whereas 30% said “A little”, 30% said “Not at all” and 20% said “Quite a lot”, as can be seen in Figure 6.27: Responses to PO8 Manage Quality Question 10.

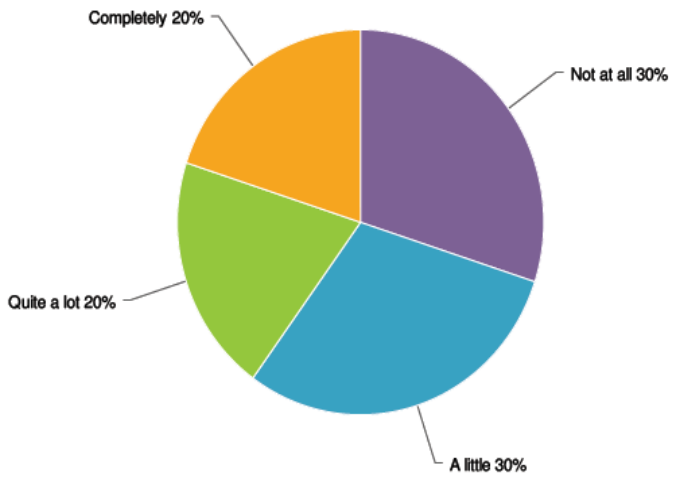


Figure 6.27: Responses to PO8 Manage Quality Question 10

In Question 12, 50% of the surveyed said “A little” for common tools and practices for quality management are emerging, 40% said “Quite a lot” and 10% said “Completely”, as can be seen in Figure 6.28: Responses to PO8 Manage Quality Question 12.

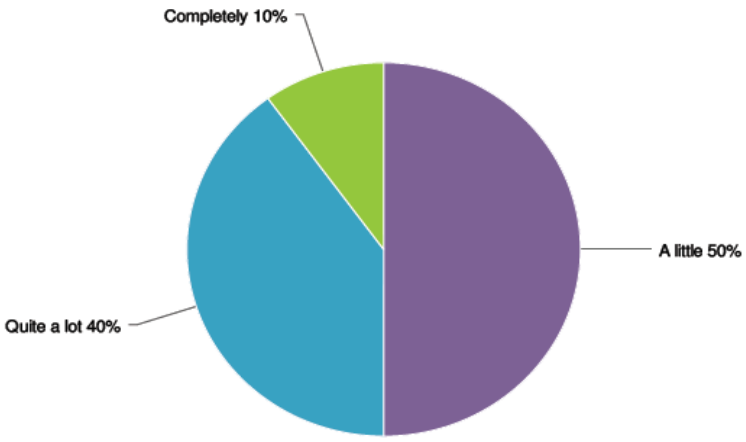


Figure 6.28: Responses to PO8 Manage Quality Question 12

PO9: Assess and Manage IT Risks

Maturity Level	Statement no.	Statements
0 – Non Existent	1	Risk assessment for processes and business decisions does not occur. How much do you agree?
	2	The organisation does not consider the business impacts associated with security vulnerabilities and development project uncertainties. How much do you agree?
	3	Risk management is not identified as relevant to acquiring IT solutions and delivering IT services. How much do you agree?
1 – Initial/ad Hoc	4	IT risks are considered in an ad hoc manner. Informal assessments of project risk take place as determined by each project. How much do you agree?
	5	Risk assessments are sometimes identified in a project plan but are rarely assigned to specific managers. How much do you agree?
	6	Specific IT-related risks, such as security, availability and integrity, are occasionally considered on a project-by-project basis. How much do you agree?
	7	IT-related risks affecting day-to-day operations are seldom discussed at management meetings. How much do you agree?
	8	Where risks have been considered, mitigation is inconsistent. There is an emerging understanding that IT risks are important and need to be considered.
2 Repeatable but Intuitive	9	A developing risk assessment approach exists and is implemented at the discretion of the project managers. How much do you agree?
	10	The risk management is usually at a high level and is typically applied only to major projects or in response to problems. How much do you agree?
	11	Risk mitigation processes are starting to be implemented where risks are identified. How much do you agree?
3 – Defined	12	An organisation wide risk management policy defines when and how to conduct risk assessments. Risk management follows a defined process that is documented. How much do you agree?
	13	Risk management training is available to all staff members. How much do you agree?
	14	Decisions to follow the risk management process and receive training are left to the individual's discretion. How much do you agree?
	15	The methodology for the assessment of risk is convincing and sound and ensures that key risks to the business are identified. How much do you agree?
	16	A process to mitigate key risks is usually instituted once the risks are identified. How much do you agree?
	17	Job descriptions consider risk management responsibilities. How much do you agree?
4 – Managed and Measurable	18	The assessment and management of risk are standard procedures. Exceptions to the risk management process are reported to IT management. How much do you agree?
	19	IT risk management is a senior management-level responsibility. How much do you agree?
	20	Risk is assessed and mitigated at the individual project level and also regularly with regard to the overall IT operation. How much do you agree?
	21	Management is advised on changes in the business and IT environment that could significantly affect the IT-related risk scenarios. How much do you agree?
	22	Management is able to monitor the risk position and make informed decisions regarding the exposure it is willing to accept. How much do you agree?
	23	All identified risks have a nominated owner, and senior management and IT management determine the levels of risk that the organisation will tolerate. How much do you agree?
	24	IT management develops standard measures for assessing risk and defining risk/return ratios. How much do you agree?
	25	Management budgets for an operational risk management project to reassess risks on a regular basis. How much do you agree?
	26	A risk management database is established, and part of the risk management processes is beginning to be automated. IT management considers risk mitigation strategies. How much do you agree?
5 – Optimised	27	Risk management develops to the stage where a structured, organisation wide process is enforced and well managed. Good practices are applied across the entire organisation. How much do you agree?
	28	Guidance is drawn from leaders in the field, and the IT organisation takes part in peer groups to exchange experiences. How much do you agree?
	29	Risk management is truly integrated into all business and IT operations, is well accepted and extensively involves the users of IT services. How much do you agree?
	30	Management detects and acts when major IT operational and investment decisions are made without consideration of the risk management plan. How much do you agree?
	31	Management continually assesses risk mitigation strategies. How much do you agree?

Table 6.17: Statements for PO9: Assess and Manage IT Risks

The statements of PO9 maturity model definition were divided into 31 single questions, shown in Table 6.20: Statements for PO9: Assess and Manage IT Risks. The process was distributed among Chief of a section, Head of a group or department, Senior specialist or Analyst and Specialist or Analyst. The bar chart in Figure 6.29: Maturity Results for PO9 Assess and Manage IT Risks, shows assessment of the maturity levels and illustrates results were below the average.

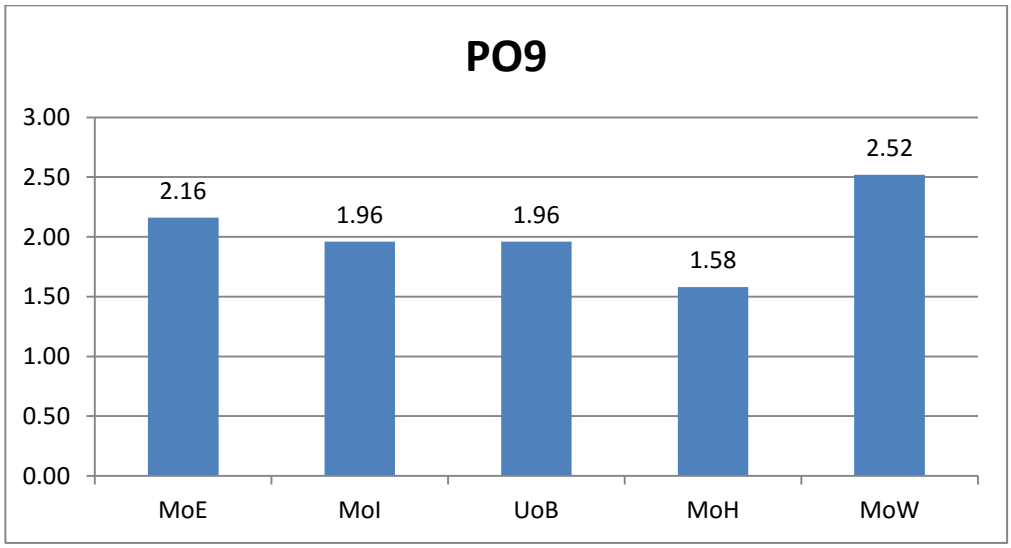


Figure 6.29: Maturity Results for PO9 Assess and Manage IT Risks

The process assessed if the organisations are adopting a risk management framework that is integrated in business and operational risk assessment, risk mitigation and communicating risk remediation action plan. The bar chart in Figure 6.29: Maturity Results for PO9 Assess and Manage IT Risks, illustrates that results are fluctuating between *Initial* level and *Repeatable but Intuitive* level in addition to one organisation heading to *Defined Process* level. Further analysis to responses on Questions between level 1 and 2 revealed significant findings to consider.

For instance, in Question 4, 50% of the respondents indicated that "Quite a lot" that IT risks are considered in an ad hoc manner and informal assessments of project risk take place as determined by each project and the remaining 50% said "A little", as can be seen in Figure 6.30: Responses to PO9 Assess and Manage IT Risks Question 4.

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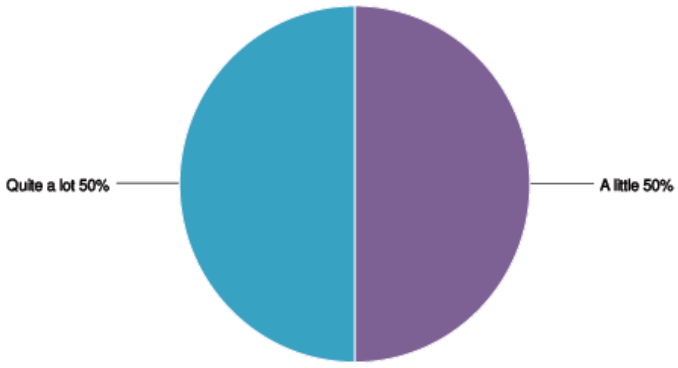

Figure 6.30: Responses to PO9 Assess and Manage IT Risks Question 4

In Question 5, the majority of respondents (66.7%) indicated "Quite a lot" that risk assessments are sometimes identified in a project plan but are rarely assigned to a specific manager and 16.7% said "Completely" and another 16.7% said "Not at all", as can be seen in Figure 6.31: Responses to PO9 Assess and Manage IT Risks Question 5.

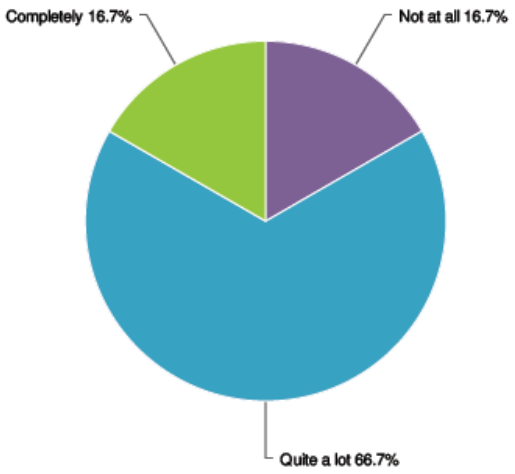

Figure 6.31: Responses to PO9 Assess and Manage IT Risks Question 5

For the subject that risk management is usually at a high level and is typically applied only to major projects or in response to problems, 40% indicated "Not at all", 20% indicated "A little"

and the remaining 40% indicated “Quite a lot”, as can be seen in Figure 6.32: Responses to PO9 Assess and Manage IT Risks Question 10.

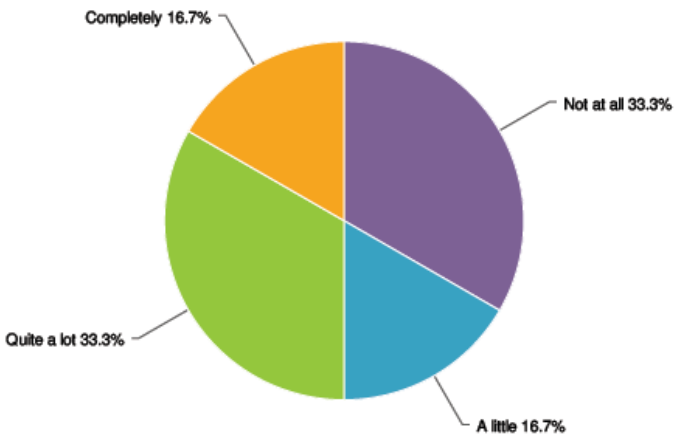

Figure 6.32: Responses to PO9 Assess and Manage IT Risks Question 10

In response to Question 11, 50% of the respondents indicated “A little” for risk mitigating processes are starting to be implemented when risks are identified, whereas 33.3% said “Quite a lot” and 16.7% said “Completely”, as can be seen in Figure 6.33: Responses to PO9 Assess and Manage IT Risks Question 11.

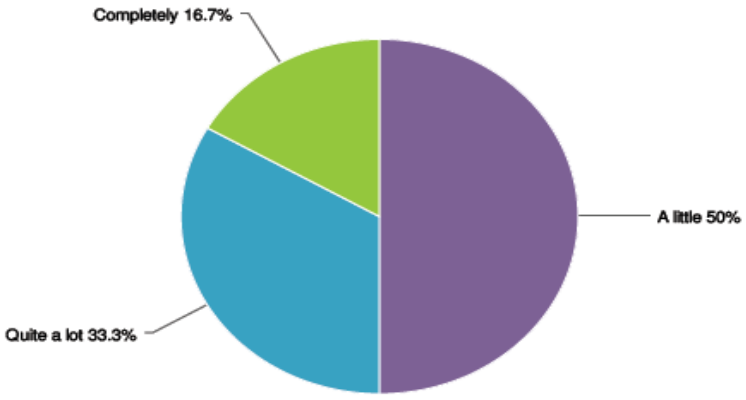

Figure 6.33: Responses to PO9 Assess and Manage IT Risks Question 11

AI6: Manage changes

Maturity Level	Statement no.	Statements
0 – Non Existent	1	There is no defined change management process, and changes can be made with virtually no control. How much do you agree?
	2	There is no awareness that change can be disruptive for IT and business operations, and no awareness of the benefits of good change management. How much do you agree?
1 – Initial/ad Hoc	3	It is recognised that changes should be managed and controlled. How much do you agree?
	4	Practices vary, and it is likely that unauthorised changes take place. How much do you agree?
	5	There is poor or non-existent documentation of change, and configuration documentation is incomplete and unreliable. How much do you agree?
	6	Errors are likely to occur together with interruptions to the production environment caused by poor change management. How much do you agree?
2 Repeatable but Intuitive	7	There is an informal change management process in place and most changes follow this approach; however, it is unstructured, rudimentary and prone to error. How much do you agree?
	8	Configuration documentation accuracy is inconsistent, and only limited planning and impact assessment take place prior to a change. How much do you agree?
3 – Defined	9	There is a defined formal change management process in place, including categorisation, prioritisation, emergency procedures, change authorisation and release management, and compliance is emerging. How much do you agree?
	10	Workarounds take place, and processes are often bypassed. How much do you agree?
	11	Errors may occur and unauthorised changes occasionally occur. How much do you agree?
	12	The analysis of the impact of IT changes on business operations is becoming formalised, to support planned rollouts of new applications and technologies. How much do you agree?
4 – Managed and Measurable	13	The change management process is well developed and consistently followed for all changes, and management is confident that there are minimal exceptions. How much do you agree?
	14	The process is efficient and effective, but relies on considerable manual procedures and controls to ensure that quality is achieved. How much do you agree?
	15	All changes are subject to thorough planning and impact assessment to minimise the likelihood of post-production problems. How much do you agree?
	16	An approval process for changes is in place. How much do you agree?
	17	Change management documentation is current and correct, with changes formally tracked. How much do you agree?
	18	Configuration documentation is generally accurate. How much do you agree?
	19	IT change management planning and implementation are becoming more integrated with changes in the business processes, to ensure that training, organisational changes and business continuity issues are addressed. How much do you agree?
	20	There is increased co-ordination between IT change management and business process redesign. How much do you agree?
	21	There is a consistent process for monitoring the quality and performance of the change management process. How much do you agree?
5 – Optimised	22	The change management process is regularly reviewed and updated to stay in line with good practices. How much do you agree?
	23	The review process reflects the outcome of monitoring. How much do you agree?
	24	Configuration information is computer-based and provides version control. How much do you agree?
	25	Tracking of changes is sophisticated and includes tools to detect unauthorised and unlicensed software. How much do you agree?
	26	IT change management is integrated with business change management to ensure that IT is an enabler in increasing productivity and creating new business opportunities for the organisation. How much do you agree?

Table 6.18: Statements for AI6: Manage Changes

The statements of AI6 maturity model definition were divided into 26 single questions, shown in Table 6.21: Statements for AI6: Manage Changes. This process has been distributed among Chief of Section, Head of a group or department, Senior specialist, Analyst and Programmer. The bar chart in Figure 6.34: AI6 Manage Changes Maturity Results, shows the process assessment levels and illustrates that results fluctuate between 2.11 and 3.15.

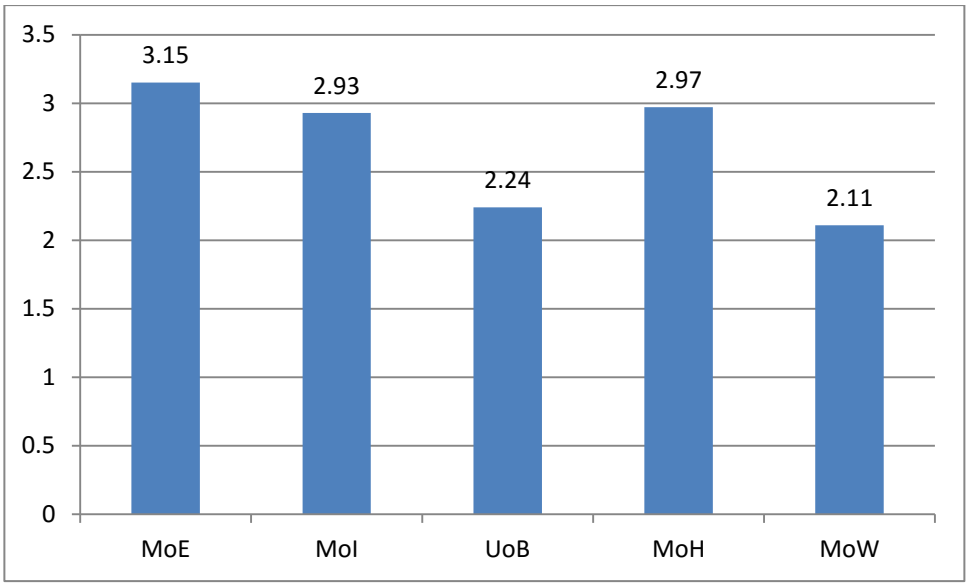

Figure 6.34: AI6 Manage Changes Maturity Results

The process assessed the managing and control to all changes including emergency maintenance and patches while considering the impact to infrastructure and applications. Mapping the results in Figure 6.34 to the COBIT Maturity Model reveals that maturity level is still between *Repeatable but Intuitive* level and *Defined Process* level. Three organisations obtained results over the average of 2.75.

Further analysis is adopted to find the weakest parts in this process. Responses for Question 7 show that 14.3% said "Not at all", 50% said "A little", 21.4% said "Quite a lot" and 14.3% "Completely" that there is informal change management process in place and most changes follow this approach; however, it is unstructured, rudimentary and prone to error, as can be seen in Figure 6.35: Responses to AI6: Manage changes Question 7. In Question 10, 7.1% said "Not at all", 64.3% said "A little" and 28.6% said "Quite a lot" that workarounds take

place and processes are often bypassed, as can be seen in Figure 6.36: Responses to AI6: Manage changes Question 10.

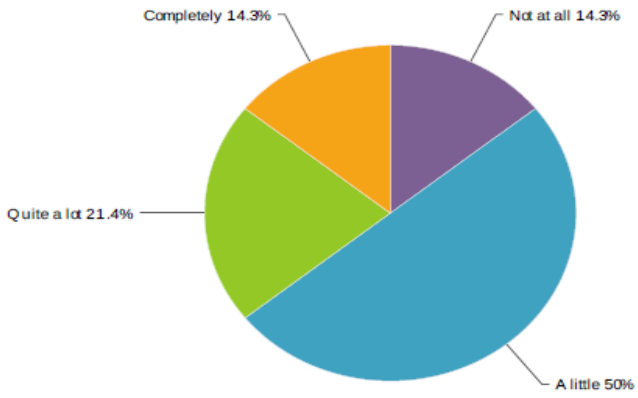

Figure 6.35: Responses to AI6: Manage changes Question 7

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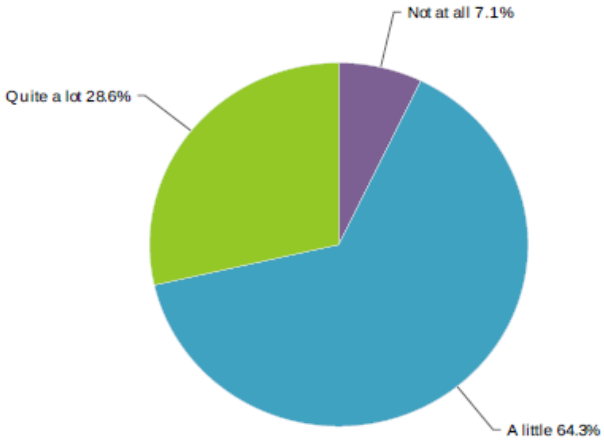

Figure 6.36: Responses to AI6: Manage changes Question 10

In Question 11, 57.1% said “A little”, 21.4% said “Quite a lot” and 21.4% said “Not at all” that errors may occur and unauthorized changes occasionally occur, as can be seen in Figure 6.37: Responses to AI6: Manage changes Question 11.

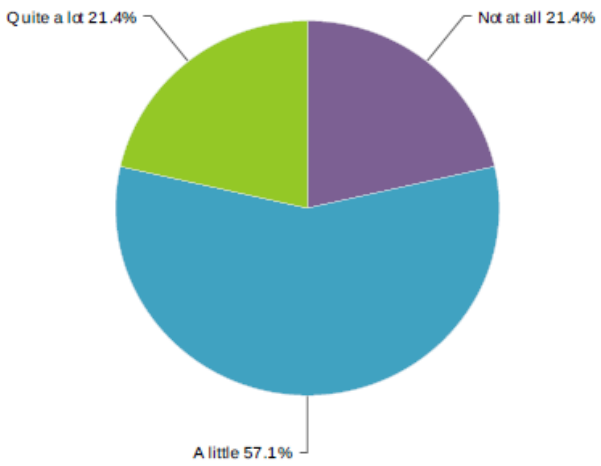

Figure 6.37: Responses to AI6: Manage changes Question 11

DS1: Define and Manage Service Levels

Maturity Level	Statement no.	Statements
0 – Non Existent	1	Management has not recognised the need for a process defining service levels. How much do you agree?
	2	Accountabilities and responsibilities for monitoring them are not assigned. How much do you agree?
1 – Initial/ad Hoc	3	There is awareness of the need to manage service levels, but the process is informal and reactive. How much do you agree?
	4	The responsibility and accountability for defining and managing services are not defined. How much do you agree?
	5	If performance measurements exist, they are qualitative only with imprecisely defined goals. How much do you agree?
	6	Reporting is informal, infrequent and inconsistent. How much do you agree?
2 Repeatable but Intuitive	7	There are agreed-upon service levels, but they are informal and not reviewed. How much do you agree?
	8	Service level reporting is incomplete and may be irrelevant or misleading for customers. How much do you agree?
	9	Service level reporting is dependent on the skills and initiative of individual managers. How much do you agree?
	10	A service level co-ordinator is appointed with defined responsibilities, but limited authority. How much do you agree?
	11	If a process for compliance to SLAs exists, it is voluntary and not enforced. How much do you agree?
3 – Defined	12	Responsibilities are well defined, but with discretionary authority. How much do you agree?
	13	The SLA development process is in place with checkpoints for reassessing service levels and customer satisfaction. How much do you agree?
	14	Services and service levels are defined, documented and agreed-upon using a standard process. How much do you agree?
	15	Service level shortfalls are identified, but procedures on how to resolve shortfalls are informal. How much do you agree?
	16	There is a clear linkage between expected service level achievement and the funding provided. How much do you agree?
	17	Service levels are agreed to, but they may not address business needs. How much do you agree?
4 – Managed and Measurable	18	Service levels are increasingly defined in the system requirements definition phase and incorporated into the design of the application and operational environments. How much do you agree?
	19	Performance measures reflect customer needs, rather than IT goals. How much do you agree?
	20	The measures for assessing service levels are becoming standardised and reflect industry norms. How much do you agree?
	21	The criteria for defining service levels are based on business criticality and include availability, reliability, performance, growth capacity, user support, continuity planning and security considerations. How much do you agree?
	22	Root cause analysis is routinely performed when service levels are not met. How much do you agree?
	23	The reporting process for monitoring service levels is becoming increasingly automated. How much do you agree?
	24	Operational and financial risks associated with not meeting agreed-upon service levels are defined and clearly understood. How much do you agree?
	25	A formal system of measurement is instituted and maintained. How much do you agree?
5 – Optimised	26	Service levels are continuously re-evaluated to ensure alignment of IT and business objectives, whilst taking advantage of technology, including the cost-benefit ratio. How much do you agree?
	27	All service level management processes are subject to continuous improvement. How much do you agree?
	28	Customer satisfaction levels are continuously monitored and managed. How much do you agree?
	29	Expected service levels reflect strategic goals of business units and are evaluated against industry norms. How much do you agree?
	30	IT management has the resources and accountability needed to meet service level targets, and compensation is structured to provide incentives for meeting these targets. How much do you agree?
	31	Senior management monitors performance metrics as part of a continuous improvement process. How much do you agree?

Table 6.19: Statements for DS1: Define and Manage Service Levels

The statements of DS1 maturity model definition were divided into 31 single questions and participants had to choose one answer: Not at all, A little, Quite a lot and Completely, as shown in Table 6.22: Statements for DS1: Define and Manage Service Levels. The process was distributed among Chief of Section, Head of a group or department, Senior specialist, Analyst and programmer. The bar chart in Figure 6.38: DS1 Define and Manage Service Levels Maturity Results, is used to show the assessment of the levels and illustrates that results fluctuate between 1.73 and 3.52.

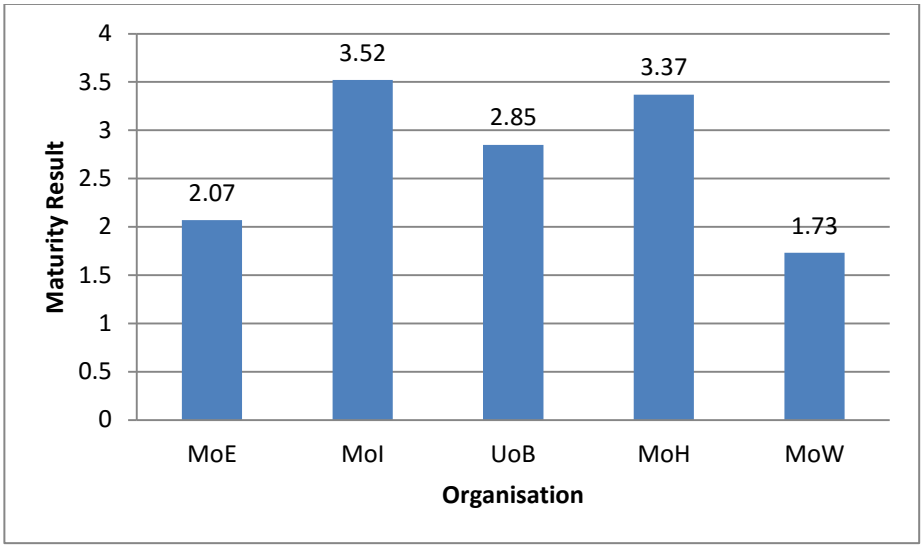

Figure 6.38: DS1 Define and Manage Service Levels Maturity Results

The process captured the communication between IT management and business customers in a documented manner to define this agreement. This document is important for defining monitoring and reporting procedures and therefore enabling the alignment between IT services and the related business requirements. With reference to the COBIT Maturity Model; the maturities illustrated in Figure 6.38: DS1 Define and Manage Service Levels Maturity Results; are close to Managed and Measurable level.

In general, the maturity of this process is comparatively close to the average of 2.75. It can be seen from Figure 6.38: DS1 Define and Manage Service Levels Maturity Results that three organisations obtained results over 2.75 and the remaining two organisations obtained 1.73 and 2.07. Further investigating these responses within the range revealed some gaps. In

Question 2 for instance, 43.8% said “Not at all”, 12.5% said “A little”, 25% said “Quite a lot” and 18.8% said “Completely” that accountabilities and responsibilities for monitoring them are not assigned, as can be seen in Figure 6.39: Responses to DS1: Define and Manage Service Levels Question 2.

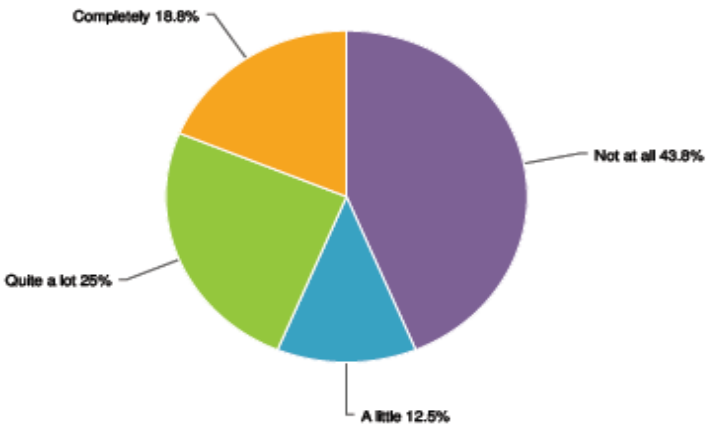

Figure 6.39: Responses to DS1: Define and Manage Service Levels Question 2

In Question 4, the statement assessed if the responsibility and accountability for defining and managing services are not defined. Results show that 18.8% said “Not at all”, 37.5% said “A little”, 31.3% said “Quite a lot” and 12.5% said “Completely”, as can be seen in Figure 6.40: Responses to DS1: Define and Manage Service Levels Question 4.

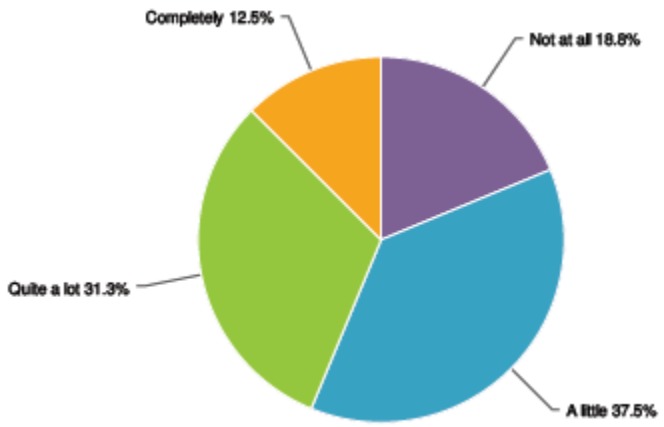

Figure 6.40: Responses to DS1: Define and Manage Service Levels Question 4

Question 9 tackled if service level reporting is dependent on the skills and initiative of individual managers. The responses show that 37.5% said "A little", 56.3% said "Quite a lot" and only 6.3% said "Completely", as can be seen in Figure 6.41: Responses to DS1: Define and Manage Service Levels Question 9.

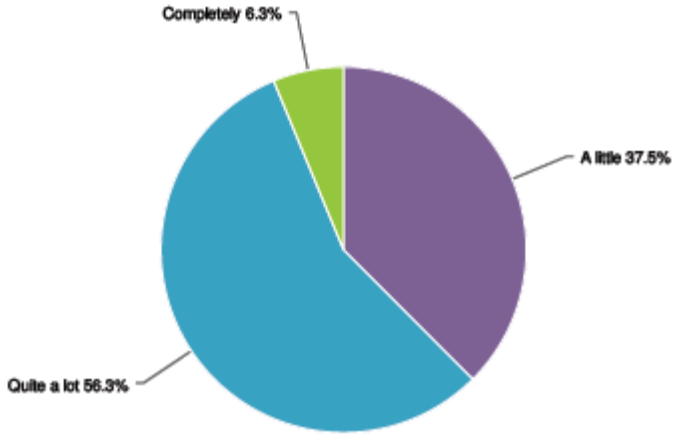

Figure 6.41: Responses to DS1: Define and Manage Service Levels Question 9

In Question 10, 12.5% said "Not at all", 56.3% said "A little", 25% said "Quite a lot" and 6.3% said "Completely" that a service level coordinator is appointed with defined

responsibilities, but limited authority, as can be seen in Figure 6.42.: Responses to DS1: Define and Manage Service Levels Question 10.

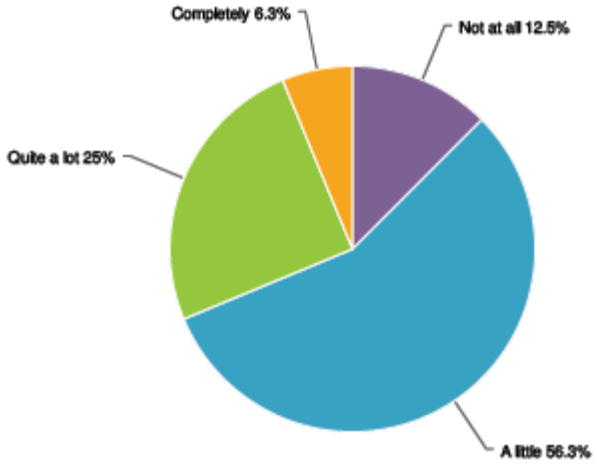

Figure 6.42: Responses to DS1: Define and Manage Service Levels Question 10

Question 17 was used to assess if service levels are agreed, but still may not address business needs. Responses show that the majority (43.8%) said “A little”, 37.5% said “Quite a lot” and only 18.8% said “Not at all”, as can be seen in Figure 6.43.: Responses to DS1: Define and Manage Service Levels Question 17.

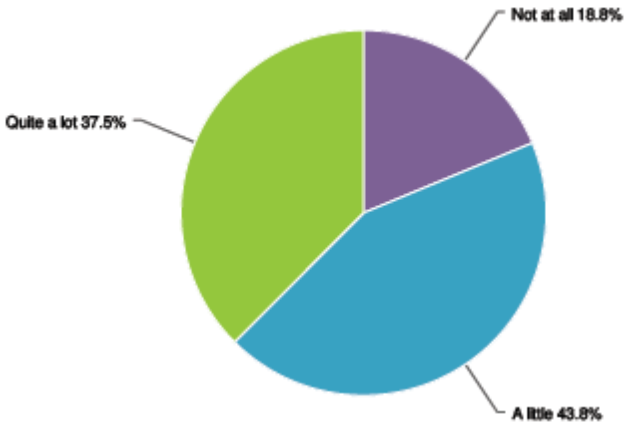

Figure 6.43: Responses to DS1: Define and Manage Service Levels Question 17

DS10: Manage Problems

Maturity Level	Statement no.	Statements
0 - Non Existent	1	There is no awareness of the need for managing problems, as there is no differentiation of problems and incidents. Therefore, there is no attempt made to identify the root cause of incidents. How much do you agree?
1 - Initial/ad Hoc	2	Personnel recognise the need to manage problems and resolve underlying causes. How much do you agree?
	3	Key knowledgeable personnel provide some assistance with problems relating to their area of expertise, but the responsibility for problem management is not assigned. How much do you agree?
	4	Information is not shared, resulting in additional problem creation and loss of productive time while searching for answers. How much do you agree?
2 Repeatable but Intuitive	5	There is a wide awareness of the need for and benefits of managing IT-related problems within both the business units and information services function. How much do you agree?
	6	The resolution process is evolved to a point where a few key individuals are responsible for identifying and resolving problems. How much do you agree?
	7	Information is shared amongst staff in an informal and reactive way. How much do you agree?
	8	The service level to the user community varies and is hampered by insufficient, structured knowledge available to the problem manager. How much do you agree?
3 - Defined	9	The need for an effective integrated problem management system is accepted and evidenced by management support, and budgets for the staffing and training are available. How much do you agree?
	10	Problem resolution and escalation processes have been standardised. How much do you agree?
	11	The recording and tracking of problems and their resolutions are fragmented within the response team, using the available tools without centralisation. How much do you agree?
	12	Deviations from established norms or standards are likely to be undetected. How much do you agree?
	13	Information is shared among staff in a proactive and formal manner. How much do you agree?
	14	Management review of incidents and analysis of problem identification and resolution are limited and informal. How much do you agree?
4 - Managed and Measurable	15	The problem management process is understood at all levels within the organisation. Responsibilities and ownership are clear and established. How much do you agree?
	16	Methods and procedures are documented, communicated and measured for effectiveness. The majority of problems are identified, recorded and reported, and resolution is initiated. How much do you agree?
	17	Knowledge and expertise are cultivated, maintained and developed to higher levels, as the function is viewed as an asset and major contributor to the achievement of IT objectives and improvement of IT services. How much do you agree?
	18	Problem management is well integrated with interrelated processes, such as incident, change, availability and configuration management, and assists customers in managing data, facilities and operations. How much do you agree?
5 - Optimised	19	The problem management process is evolved into a forward-looking and proactive one, contributing to the IT objectives. Problems are anticipated and prevented. How much do you agree?
	20	Knowledge regarding patterns of past and future problems is maintained through regular contacts with vendors and experts. How much do you agree?
	21	The recording, reporting and analysis of problems and resolutions are automated and fully integrated with configuration data management. How much do you agree?
	22	Most systems have been equipped with automatic detection and warning mechanisms, which are continuously tracked and evaluated. How much do you agree?
	23	The problem management process is analysed for continuous improvement based on analysis of measures and is reported to stakeholders. How much do you agree?

Table 6.20: Statements for DS10: Manage Problems

The statements of DS10 maturity model definition were divided into 23 single questions, shown in Table 6.23: Statements for DS10: Manage Problems. The process was distributed among Chief of Section, Head of a group or department, Senior specialist, Analyst and Programmer. The bar chart in Figure 6.44: DS10 Manage Problems Maturity Results, is used to show the process assessments and illustrates that results fluctuate between 1.91 and 3.18.

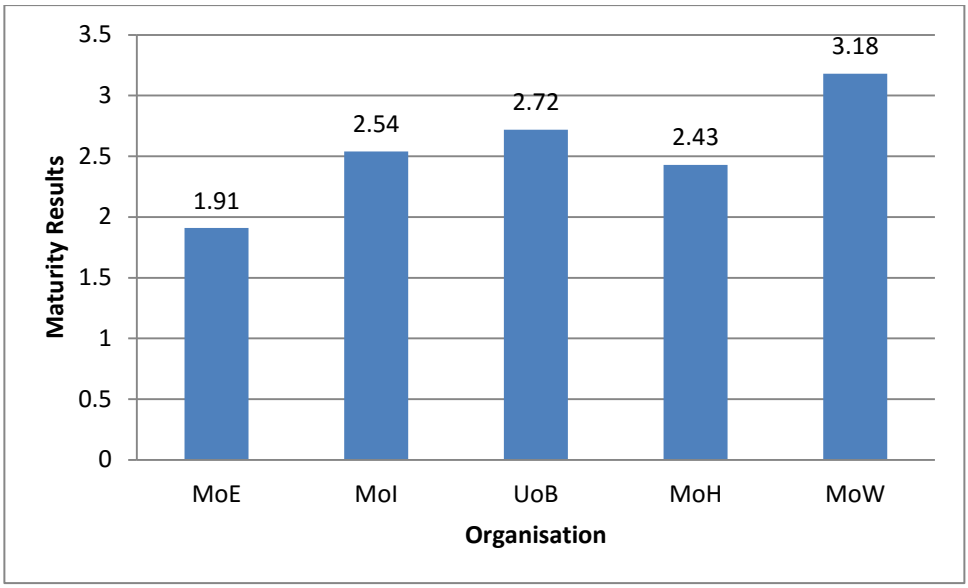

Figure 6.44: DS10 Manage Problems Maturity Results

The process assessed if organisations are implementing a classification method to verify the level of the problem, root cause analysis and resolution of the problem. The management of the problem includes forming recommendations for improvements, maintenance and review of the status. This will have an influence on the organisation in improving service levels, reducing costs and conveying customer satisfaction.

Figure 6.44: DS10 Manage Problems Maturity Results, shows that maturity results are between *Repeatable but Intuitive* and *Defined process* levels. Four organisations obtained results below the average 2.75 whereas one organisation obtained 3.18. Further analysis of the statements between the intervals of the maturity levels obtained reveals some significant gaps. Responses to Question 3 show that 50% said "Quite a lot" for key knowledgeable personnel providing some assistance with problems relating to their area of expertise;

however, responsibilities for problem management is not assigned. The remaining 50% is divided into 16.7% equivalently for “Completely”, “Not at all” and “A little”, as can be seen in Figure 6.45: Responses to DS10: Manage Problems Question 3.

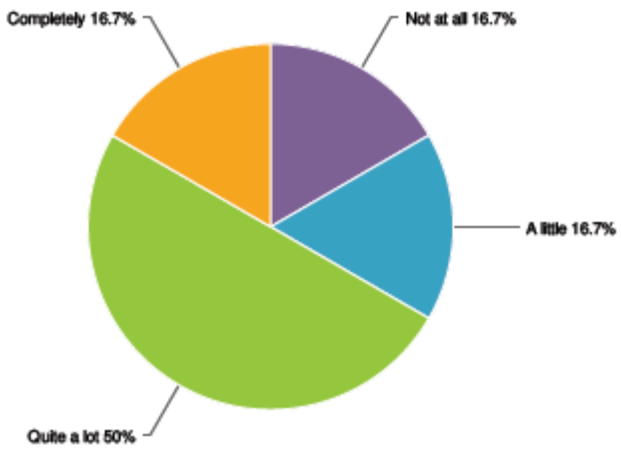

Figure 6.45: Responses to DS10: Manage Problems Question 3

It is apparent from the result in Question 8 that the majority (83.3%) of responses said “A little” when assessed if the service level to the user community varies and is hampered by insufficient, structured knowledge available to the problem manager. The remaining 16.7% said “Quite a lot”, as can be seen in Figure 6.46: Responses to DS10: Manage Problems Question 8.

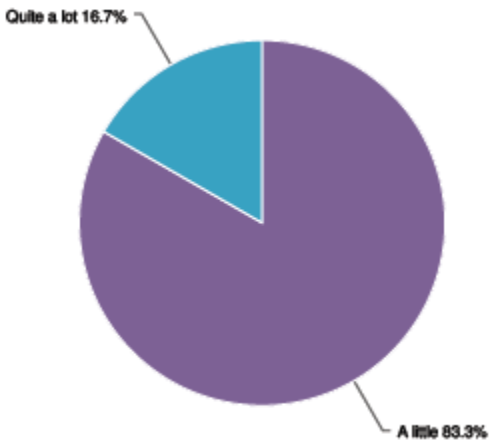

Figure 6.46: Responses to DS10: Manage Problems Question 8

Responses to Question 14 show that 50% said “a little”, 33.3% said “Quite a lot” and 16.7% said “Not at all” that management review of incidents and analysis of problem identifications and resolution are limited and informal, as can be seen in Figure 6.47: Responses to DS10: Manage Problems Question 14.

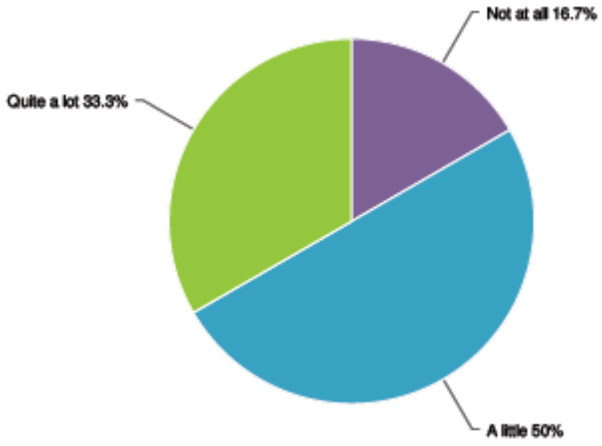

Figure 6.47: Responses to DS10: Manage Problems Question 14

ME2: Monitor and Evaluate Internal Control

Maturity Level	1.12. Statement no.	1.13. Statements
0 - Non Existent	1	The organisation lacks procedures to monitor the effectiveness of internal controls. How much do you agree?
	2	Management internal control reporting methods are absent. How much do you agree?
	3	There is a general unawareness of IT operational security and internal control assurance. How much do you agree?
	4	Management and employees have an overall lack of awareness of internal controls. How much do you agree?
1 - Initial/ad Hoc	5	Management recognises the need for regular IT management and control assurance. How much do you agree?
	6	Individual expertise in assessing internal control adequacy is applied on an ad hoc basis. How much do you agree?
	7	IT management has not formally assigned responsibility for monitoring the effectiveness of internal controls. How much do you agree?
	8	IT internal control assessments are conducted as part of traditional financial audits, with methodologies and skill sets that do not reflect the needs of the information services function. How much do you agree?
2 Repeatable but Intuitive	9	The organisation uses informal control reports to initiate corrective action initiatives. How much do you agree?
	10	Internal control assessment is dependent on the skill sets of key individuals. How much do you agree?
	11	The organisation has an increased awareness of internal control monitoring. How much do you agree?
	12	Information service management performs monitoring over the effectiveness of what it believes are critical internal controls on a regular basis. How much do you agree?
	13	Methodologies and tools for monitoring internal controls are starting to be used, but not based on a plan. How much do you agree?
	14	Risk factors specific to the IT environment are identified based on the skills of individuals. How much do you agree?
3 - Defined	15	Management supports and institutes internal control monitoring. How much do you agree?
	16	Policies and procedures are developed for assessing and reporting on internal control monitoring activities. How much do you agree?
	17	An education and training programme for internal control monitoring is defined. How much do you agree?
	18	A process is defined for self-assessments and internal control assurance reviews, with roles for responsible business and IT managers. How much do you agree?
	19	Tools are being utilised but are not necessarily integrated into all processes. How much do you agree?
	20	IT process risk assessment policies are being used within control frameworks developed specifically for the IT organisation. How much do you agree?
4 - Managed and Measurable	21	Management implements a framework for IT internal control monitoring. The organisation establishes tolerance levels for the internal control monitoring process. How much do you agree?
	22	Tools are implemented to standardise assessments and automatically detect control exceptions. How much do you agree?
	23	A formal IT internal control function is established, with specialised and certified professionals utilising a formal control framework endorsed by senior management. How much do you agree?
	24	Skilled IT staff members are routinely participating in internal control assessments. How much do you agree?
	25	A metrics knowledge base for historical information on internal control monitoring is established. Peer reviews for internal control monitoring are established. How much do you agree?
5 - Optimised	26	Management establishes an organisation wide continuous improvement programme that takes into account lessons learned and industry good practices for internal control monitoring. How much do you agree?
	27	The organisation uses integrated and updated tools, where appropriate, that allow effective assessment of critical IT controls and rapid detection of IT control monitoring incidents. How much do you agree?
	28	Knowledge sharing specific to the information services function is formally implemented. How much do you agree?

Table 6.21: Statements for ME2: Monitor and Evaluate Internal Control

The statements of ME2 maturity model definition were divided into 28 single questions and participants had to choose one answer: Not at all, A little, Quite a lot and Completely, shown in Table 6.24: Statements for ME2: Monitor and Evaluate Internal Control. The process was distributed among Chief of Section, Head of a group or department, Senior specialist, Analyst and Programmer. The bar chart in Figure 6.48: ME2 Monitor and Evaluate Internal Control Maturity Results, shows the process assessment levels and illustrates that results fluctuate between 2.05 and 2.63.

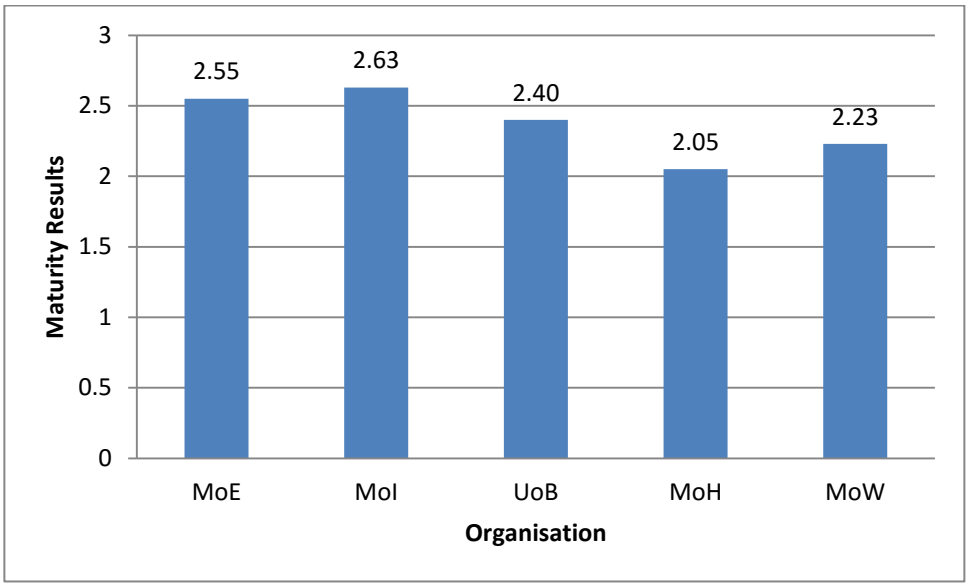

Figure 6.48: ME2 Monitor and Evaluate Internal Control Maturity Results

The process assessed if organisations are adopting a defined monitoring process for establishing an effective internal control. This is important to control all IT-related activities and therefore identifying improving actions. The main driver for this process is complying with IT-related laws. The results obtained are mapped to the COBIT maturity model and show that the maturities are between *Repeatable but Intuitive* level and *Defined Process* level. No significant findings were noted within this process as all organisations scored below average. Further analysis on the respondents' view is adopted for investigating existing gaps. In Question 9, responses show that 50% said "A little", 33.3% said "Quite a lot" and 16.7% said "Completely" that the organisation uses informal control reports to initiate corrective action

initiatives, as can be seen in Figure 6.49: Responses to ME2 Monitor and Evaluate Internal Control Question 9. In Question 12, 66.7% said “A little” and 33.3% said “Quite a lot” that Information service management performs monitoring of the effectiveness of what it believes are critical internal controls on a regular basis, as can be seen in Figure 6.50: Responses to ME2 Monitor and Evaluate Internal Control Question 12.

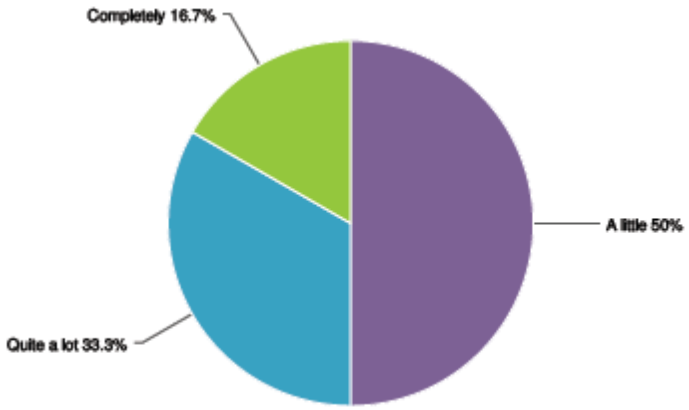

Figure 6.49: Responses to ME2 Monitor and Evaluate Internal Control Question 9

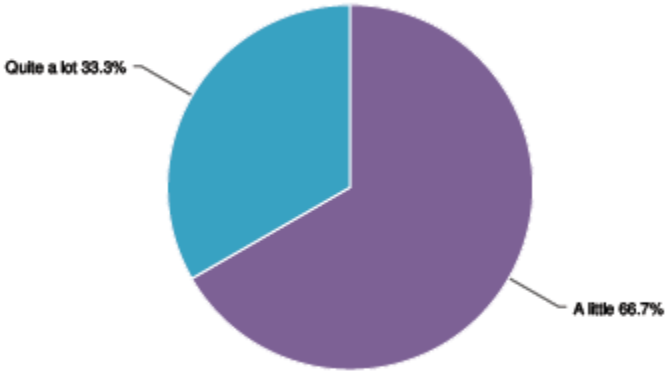

Figure 6.50: Responses to ME2 Monitor and Evaluate Internal Control Question 12

It is also apparent from Question 14 that 66.7% said “A little” and 33.3% said “Completely” that those risk factors specific to the IT environment are identified based on the skills of individuals, as can be seen in Figure 6.51: Responses to ME2 Monitor and Evaluate Internal Control Question 14.

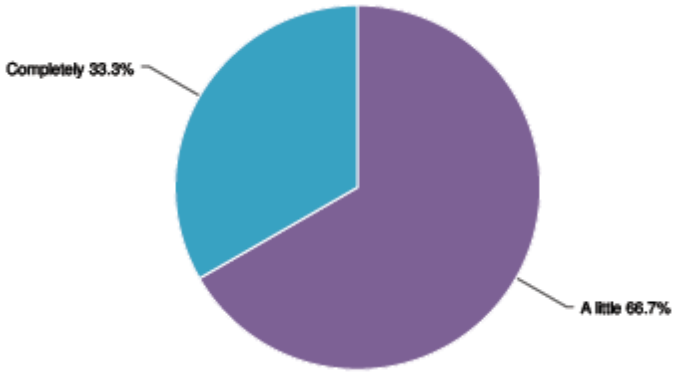

Figure 6.51: Responses to ME2 Monitor and Evaluate Internal Control Question 14

In Question 18, 16.7% said “Not at all”, 33.3% said “A little” and another 33.3% said “Quite a lot” that a process is defined for self-assessments and internal control assurance reviews, with roles for responsible business and IT managers. The remaining 16.7% said “Completely”, as can be seen in Figure 6.52: Responses to ME2 Monitor and Evaluate Internal Control Question 18.

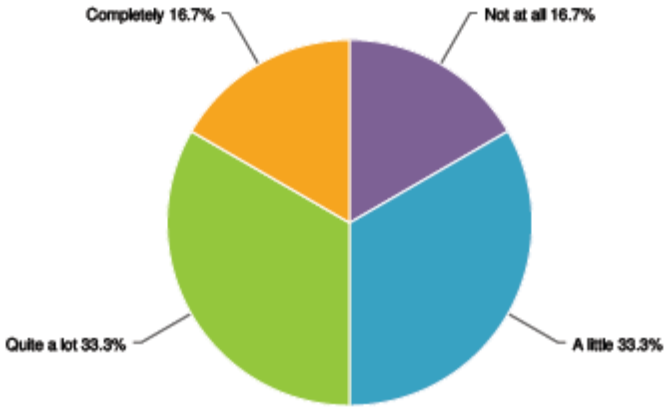

Figure 6.52: Responses to ME2 Monitor and Evaluate Internal Control Question 18

ME4: Provide IT Governance

Maturity Level	Statement no.	Statements
0 - Non Existent	1	There is a complete lack of any recognisable IT governance process. How much do you agree?
1 - Initial/ad Hoc	2	There is recognition that IT governance issues exist and need to be addressed. How much do you agree?
	3	There are ad hoc approaches applied on an individual or case-by-case basis. How much do you agree?
	4	Management's approach is reactive, and there is only sporadic, inconsistent communication on issues and approaches to address them. How much do you agree?
	5	Management has only an approximate indication of how IT contributes to business performance. How much do you agree?
	6	Management only reactively responds to an incident that has caused some loss or embarrassment to the organisation. How much do you agree?
2 Repeatable but Intuitive	7	There is awareness of IT governance issues. IT governance activities and performance indicators, which include IT planning, delivery and monitoring processes, are under development. How much do you agree?
	8	Selected IT processes are identified for improvement based on individuals' decisions. How much do you agree?
	9	Management identifies basic IT governance measurements and assessment methods and techniques; however, the process is not adopted across the organisation. How much do you agree?
	10	Communication on governance standards and responsibilities is left to the individual. How much do you agree?
	11	Individuals drive the governance processes within various IT projects and processes. How much do you agree?
	12	The processes, tools and metrics to measure IT governance are limited and may not be used to their full capacity due to a lack of expertise in their functionality. How much do you agree?
3 - Defined	13	The importance of and need for IT governance are understood by management and communicated to the organisation. How much do you agree?
	14	A baseline set of IT governance indicators is developed where linkages between outcome measures and performance indicators are defined and documented. How much do you agree?
	15	Procedures are standardised and documented. Management communicates standardised procedures, and training is established. How much do you agree?
	16	Tools are identified to assist with overseeing IT governance. How much do you agree?
	17	Dashboards are defined as part of the IT balanced business scorecard. However, it is left to the individual to get training, follow the standards and apply them. How much do you agree?
	18	Processes may be monitored, but deviations, while mostly being acted upon by individual initiative, are unlikely to be detected by management. How much do you agree?
4 - Managed and Measurable	19	There is full understanding of IT governance issues at all levels. There is a clear understanding of who the customer is, and responsibilities are defined and monitored through SLAs. How much do you agree?
	20	Responsibilities are clear and process ownership is established. How much do you agree?
	21	IT processes and IT governance are aligned with and integrated into the business and the IT strategy. How much do you agree?
	22	Improvement in IT processes is based primarily upon a quantitative understanding, and it is possible to monitor and measure compliance with procedures and process metrics. How much do you agree?
	23	All process stakeholders are aware of risks, the importance of IT and the opportunities it can offer. Management defines tolerances under which processes must operate. How much do you agree?
	24	There is limited, primarily tactical, use of technology, based on mature techniques and enforced standard tools. How much do you agree?
	25	IT governance has been integrated into strategic and operational planning and monitoring processes. How much do you agree?
	26	Performance indicators over all IT governance activities are being recorded and tracked, leading to enterprisewide improvements. How much do you agree?
	27	Overall accountability of key process performance is clear, and management is rewarded based on key performance measures. How much do you agree?
5 - Optimised	28	There is an advanced and forward-looking understanding of IT governance issues and solutions. How much do you agree?
	29	Training and communication are supported by leading-edge concepts and techniques. How much do you agree?
	30	Processes are refined to a level of industry good practice, based on results of continuous improvement and maturity modelling with other organisations. How much do you agree?
	31	The implementation of IT policies leads to an organisation, people and processes that are quick to adapt and fully support IT governance requirements. How much do you agree?
	32	All problems and deviations are root cause analysed, and efficient action is expediently identified and initiated. How much do you agree?

Table 6. 22: Statements for ME4: Provide IT Governance

The statements of ME4 maturity model definition were divided into 32, shown in Table 6.25: Statements for ME4: Provide IT Governance. The process was distributed among IT Directors. The bar chart in Figure 6.53: ME4 Provide IT Governance Maturity Results, shows the assessment of the process and illustrates that results were between 2.36 and 2.98.

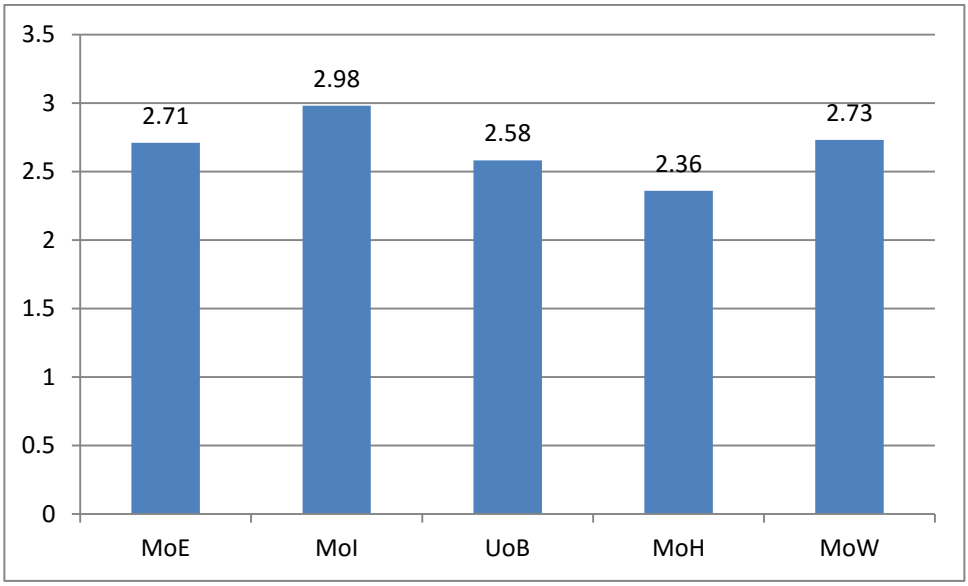

Figure 6.53: ME4 Provide IT Governance Maturity Results

The process assessed if the organisation is establishing a governance framework. This includes defining an organisational structure or a committee, processes, roles and responsibilities to ensure that IT investments are aligned and delivered in accordance with the strategies and objectives. It has been noted that the maturities are between Repeatable but Intuitive level and heading to Defined process. There were no significant findings between the maturity results because the case studies covered in this research did not have a clear understanding or know about the concept of IT Governance and how this could be implemented or adopted strategically.

Further analysis was conducted to reveal some significant gaps. Responses to Question 6 show that 60% said “A little” and 40% said “Quite a lot” that management only reactively responds to an incident that has caused some loss or embarrassment to the organization, as can be seen in Figure 6.54: Responses to ME4: Provide IT Governance Question 6. Question 7

measured if there is awareness of IT governance issues, 60% said “A little” and 40% said “Quite a lot” that IT governance activities and performance indicators, which include IT planning, delivery and monitoring processes, are under development, as can be seen in Figure 6.55: Responses to ME4: Provide IT Governance Question 7.

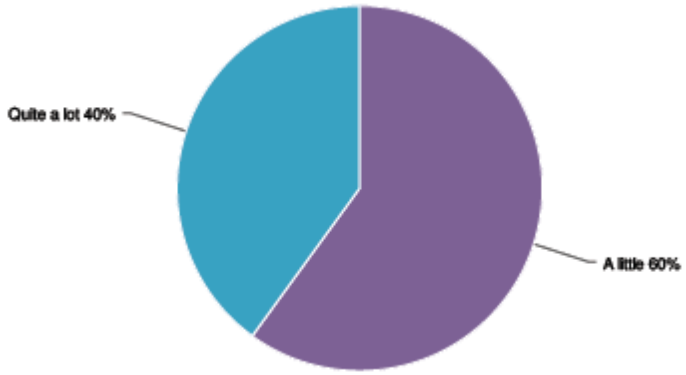

Figure 6.54: Responses to ME4: Provide IT Governance Question 6

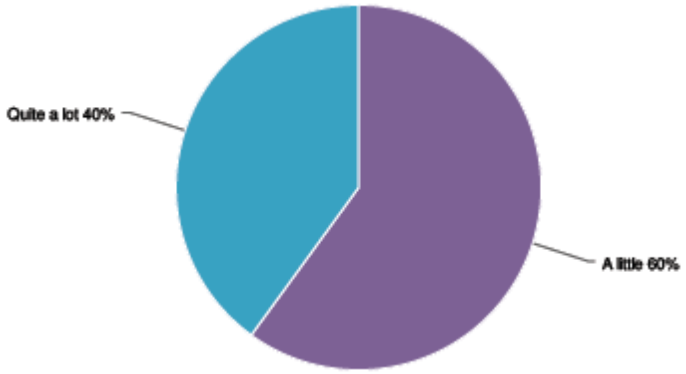

Figure 6.55: Responses to ME4: Provide IT Governance Question 7

In Question 8, responses show that 20% said “Not at all”, 20% said “A little” and the remaining 60% said “Quite a lot” that the selected IT processes are identified for improvement based on individuals' decisions, as can be seen in Figure 6.56: Responses to ME4: Provide IT Governance Question 8.

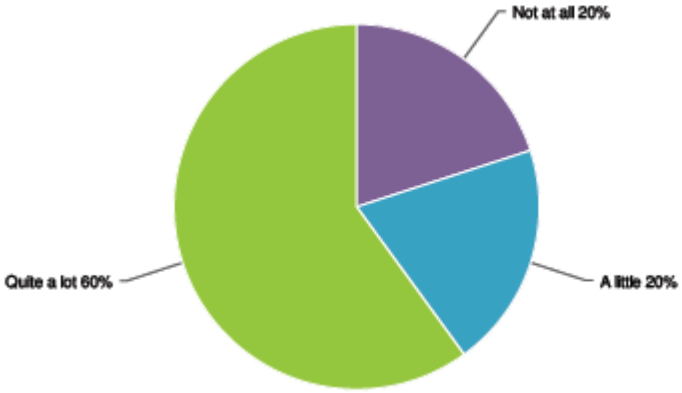

Figure 6.56: Responses to ME4: Provide IT Governance Question 8

In Question 9, 20% of responses said "A little" and 80% said "Quite a lot" that management identifies basic IT governance measurements and assessment methods, but not adopted across the organization, as can be seen in Figure 6.57: Responses to ME4: Provide IT Governance Question 9.

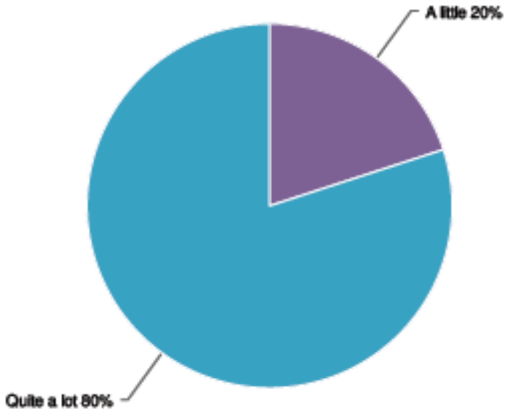

Figure 6. 57: Responses to ME4: Provide IT Governance Question 9

6.6. Conclusions

The classification of research into strong and weak processes provided a better understanding of the gaps available within public sector organisations covered in this study. On the strongest side, 10 processes obtained results above the average 2.75 and indicated that maturities are within the *Defined Process* level. This indicates that further strategic plans required approaching beyond this level and most importantly how IT Governance should function. On the weakest processes side, almost 8 processes achieved below the average. Further analysis was adopted to demonstrate response views and to recognise significant gaps. These are listed below and will be further discussed in the next chapter.

1. **IT structure:** The structure of IT Directorates needs revising and some significant lessons were to be learned from the studied organisations. One case study was found to have a comparatively optimal IT structure compared to the remaining four case studies. The structure is an important relation to IT Governance because it disseminates how the organisation organises its IT activities.

2. **Accountability culture:** Promoting the accountability culture through definite roles and responsibilities. This is to have a relationship with a body responsible to oversee the performance of tasks and the individual is responsible to deliver some justifications for their actions. It was apparent from IT Governance practice the uneven distribution of roles and responsibilities or in some cases not being given clear roles and responsibilities.

3. **Leadership skills:** The skills required for IT roles and leadership skills because they are a vital driver in IT Governance and experienced through the IT Director, or Chief Information Officer as a new position. Next is the capability available to assign IT roles respecting gender equality and what training is required to develop these skills for leading the organisation to a better maturity level.

4. **Knowledge:** Knowledge within key IT personal; the custodian of experience is a major risk in any organisation. The organisation must protect the business, performance and values delivered through promoting to *Ensure continued services* and *Manage IT Human Resources*.

5. **Root cause of problems:** Resolving the root cause of problems and incidents for prevention and increasing the organisation's performance. A lot of repeated problems were noted, for example, in relation to IT procurement, when a company delivers IT equipment that does not match the tender specification, and when companies are delivering IT equipment but delay fixing them.

6. **Enacting force:** Enforcing IT-Related laws. The legal and regulatory domain assists in defining internal controls for protecting the organisation's assets from IT-related risks. For instance, the recent enacting of the Data and Documentation Protection Law in 2014 to protect revealing sensitive information and documentation (Referendum, 2014a), and forming the National Information and Communication Technology of eGovernance Committee (ICTGC) in 2011 to focus on government entities and elevate the level of corporate maturity by modernising the ICT policy and procedures (NEWS, 2015); the results of this research will be reported to this committee.

Moreover, improving the Governance maturity needs to refocus on what is necessary to move beyond the current level and requires a clear strategy or plan for the oversight and management of IT activities. This must be discussed with the higher community or steering committee in the organisation as a basis for IT Governance, and then procedures set for the management of key Governance activities. The next chapter will present further explanations on the process maturity results. The research findings and recommendations are also presented.

Chapter Seven

Discussions and Research Findings

In the previous chapters, the researcher introduced the SHIP-ITG Model constructed from analysing the literature and the empirical investigation of five public sector organisations as introduced in Chapter Four & Chapter Five. The researcher assessed the maturity of IT Governance and used 18 COBIT 4.1 processes. The researcher converted these processes into a questionnaire to enable the insights of the fieldwork procedure for assessing IT Governance maturity and validating the conceptual model through the researcher's lens (the model was validated through participant lenses at a later stage). The empirical investigation enabled the researcher to assess the effectiveness of the COBIT maturity model in practice and this embraced another research contribution of defining the maturity criteria for the SHIP-ITG Model.

In Chapter six, the researcher provided classifications for the results into processes to demonstrate gaps within IT Governance performance and to achieve in-depth insight into these existing gaps. The findings from this study suggest that IT Governance is a shared responsibility between IT Directorates and the business at the organisational level. It requires collaboration between a set of elements and relationships. The researcher seeks to address the importance of accountability in IT Governance practice and argues that the link between IT Governance and accountability is obvious. This chapter presents a meaningful account of the results revealed in the previous chapter. This chapter begins with an overview of the research and then provides justification for the importance of IT Governance in the public sector. The

researcher revises and justifies the research outcomes and then discusses the research challenges. This chapter also presents the contributions to the body of knowledge and research limitations.

7.1. Introduction

Organisations attempt to realize the importance of IT Governance to coordinate their IT related decision-making to the extent of aligning IT assets, efforts and investments with the organisational strategic intentions (Huang et al., 2009). The concept has been a challenge and intensive research has emerged within the last decade showing development in the field of IT Governance. Debates on this subject commonly regard IT Governance as a strategic issue and a subset of corporate governance (Debreceny and Gray, 2009, Webb et al., 2006, Norshidah Mohamed, 2012). Although other debates consider how IT Governance could be treated and viewed, this has become a structural phenomenon (Grant et al., 2007, Peppard, 1999, Denise and Dieter, 2010). The structural based governance is concerned with how the IT function is being controlled or where the IT decision-making is located within the organisation, mostly focused on centralized, decentralized and federal structures (Denise and Dieter, 2010, Grant et al., 2007, Huang et al., 2010, Webb, 2006, Sambamurthy and Zmud, 1999). Debates continued when both practitioners and academics realized that the structural phenomenon provided a limited view of this complex notion (Peterson, 2004a, Grant et al., 2007). The intricacies of IT Governance moved toward process-based and IT Governance was treated as a collection of integrated forces to control and monitor IT resources while sustaining the IT/business alignment (Jordan and Musson, 2004, Nada Korac-Kakabadse, 2001). With the process view, organisations slowly recognized that IT Governance had a much broader remit and engaged all levels of an organisation. Furthermore, IT Governance comprised relational mechanisms and the importance of the collaboration between human resources to give sufficient attention to relational mechanisms for ensuring the commitment of all involved people was realised (Haes and Grembergen, 2008). The research to date has also tended to elucidate models on how to contribute to IT organisation success or implement IT Governance and enact its value in practice (Grant et al., 2007, Buchwald et al., 2014, Denise and Dieter, 2010). However, the distinct views emanating from the literature articulated the understanding of IT Governance

elements and the models emphasized the multi-dimensionality of IT Governance to extend the focus beyond structures and processes.

To realize the aim of this research, the study investigated IT Governance theory and practice in the public sector. Chapter Two (Literature Review) started with a background investigation of IT Governance definitions, reviewed previous research focus, frameworks and identified a range of empirically informed IT Governance conceptual models. In this chapter, the researcher analysed the normative literature in conjunction with research perspective to establish a conceptual model for IT Governance adoption. Therefore, gaps identified in literature were with models for IT Governance adoption in public sector organisations and the importance of accountability. As a result the researcher identified the key elements of the concept (strategic objectives, process, IT resources and human resources) which informed the researcher to develop a conceptual model; this is explained in detail in Chapter Four. In Chapter Three (Research Methodology) the researcher justified the use of multiple case studies to get insights into IT Governance practice. The selection of the five case studies was based upon the criteria of willingness to cooperate and the availability of the information.

The researcher developed a range of data collection tools using COBIT as the framework to design 18 questionnaires for face-to-face interviews and online access. In Chapter Four (IT Governance Conceptual Model), the researcher explored previous research in developing IT Governance models and justified the contribution of this research. The IT Governance Model was further validated by investigating the concept in practice using a maturity model. The researcher selected 18 key processes of 34 COBIT 4.1 processes as most important in the public sector. Using the maturity models was for the purpose of measuring the performance of IT activities in the studied five public organisations and the researcher identified the maturity of IT Governance in the Kingdom of Bahrain. The details of the five public sector organisations were presented in Chapter Five (Case Study Research). The research protocol and strategy was also identified in this chapter.

In Chapter Six (Data Analysis), the researcher reported the empirical data for the five public organisations in Kingdom of Bahrain with a high-level overview of the research analysis. In this chapter, maturity level figures for each process have been presented. The chapter also details the maturity calculation method and COBIT maturity scale used to represent the

results. Therefore, understanding the current state of process maturity will assist in planning when achieving a higher maturity level.

Sections 7.4, 7.5, 7.6 and 7.7 present a reference and justification for the research questions as introduced in Chapter One and Chapter Three.

7.2. Overview of IT Governance in Kingdom of Bahrain

Shaikh Hamad bin Isa Al-Khalifa is the current ruler of Bahrain and consented in March 1999, following the death of his father who had ruled since independence from the United Kingdom in 1971. The King, Shaikh Hamad bin Isa Al-Khalifa, is recognised as playing a critical role transforming the Kingdom of Bahrain in terms of the transparency of information flow and political reforms. The leadership of his Majesty rests on a separation of the legislative, executive, and judicial authorities. Legislative authority is assigned to the King and the Parliament, while executive authority is assigned to the King together with the Council of Ministers. The King exercises his powers directly and through the Ministers, jointly answerable to him for general government policy; each Minister is answerable for the business of his Ministry. There are 25 ministries and 34 government entities.

The Kingdom of Bahrain is considered small in terms of population with about 1,314,089, and an estimated 760 sq. km space ((CIA), 2014). However, Bahrain is achieving remarkable progress globally and the United Nations has ranked Bahrain's progress in the field of eGovernment and Government work as 1st, the same level as the Arab and Middle East States (Portal, 2014). This achievement is the result of keen endeavour to keep abreast with advancement in the Information Technology field and the following-up of the Supreme Committee of Information and Communication Technology (SCICT), chaired by His Highness Shaikh Mohammed bin Mubarak Al Khalifa, the Deputy Prime Minister.

The government of Bahrain is performing strategic efforts for the benefit of providing high quality government services by developing plans and infrastructure demands for IT and telecommunication projects. This can be seen from the preparation of E-government strategy 2012-2016 and the formation of the Bahrain National ICT eGovernance Committee. The

eGovernment Authority is responsible for coordinating and executing eGovernment initiatives in line with the strategies, plans, and programs set by the Supreme Council for Information Communication Technology (SCICT). In January 2014, Bahrain e-Government Authority announced the eGA National Strategy 2016 for enhancing governmental services performance (Agency, 2014).

The Central Informatics Organisation(CIO) is another vital body providing high standard, accurate, secure and timely information and related services for citizens (CIO, 2012). The CIO is adopting several governmental projects for changing the mainframe, main backup devices and the Disaster Recovery Site. These fundamental developments assist in the use of eGovernment systems without affecting the primary role of the ministries. The CIO takes the mission in providing an integrated environment, operating systems and updating the governmental data network lines for improving the governmental data network.

Thus, the IT Governance relates to strategic planning and implementation through the wise leadership and formation of the steering committees at a national level in Bahrain.

7.3. Importance of IT Governance in Public Sector

The main role of public sector organisations is dealing with provision of services by and for the government. Therefore, these organisations are dependent on government budgetary allocations for their funding and they do not invest much in IT. Consequently, public sector organisations have the obligation to provide the services in an ethical manner and are under pressure to provide quality of services in an affordable amount. This is due to the complex set of accountability relationships in place that extend to public services, government and parliament (Campbell et al., 2009).

Different concerns in the public sector have been intensively debated. One common factor is denoted as environmental factor in which the public sector is more exposed to legal and formal constraints rather than market exposure (Campbell et al., 2007). There is also the issue

of political influences and the periodic change in the top-level management, consequently impacting on program prioritising. Another important factor is related to organisational mandatory actions because of the interest of numerous public stakeholders and the consequences of mistakes in this sector. Indeed, managers in the public sector have less autonomy for decision-making (Campbell et al., 2007).

In the past, IT was an exclusive domain of an IT department and operated separately from other business departments. Today organisations are continuing to extend beyond their traditional physical boundaries and most organisations compete to provide services available 24 hours and 7 days a week (Health, 2015, Work, 2015). The responsibility of IT Governance is one aspect of a broad framework of Corporate Governance (Hardy, 2006). This important responsibility requires strategy settings, monitoring and ensuring the accountability of all responsibilities is delegated. The focus should be on the value of IT and reducing the risks; this is often achieved by implementing internal controls and accountability procedures throughout the organisation.

Despite all the nuances, effective IT Governance takes on an essential role for the economic and social life of citizens (Loukis and Tsouma, 2002). This importance has increased in the era of globalisation where the need for IT Governance in practice is significant for the changing nature of governance (Choudhury and Ahmed, 2002). However, there exist opposing views; first, some argue that the accountability required for the public sector entities is generally greater than for the private sector (Nicoll, 2005). Others argue that implementing similar governance structures will be unsuitable and does not fit the reality (Rocheleau and Wu, 2002). Taken together, these views suggest that public and private sectors must deploy IT Governance models in a manner most appropriate to their environment (Weill and Woodham, 2002, Janssen et al., 2013).

Through the next sections, the illustration of maturity results will be presented in conjunction with Data Analysis in Chapter Six. The discussion flow is based on classifying the process maturity into strongest and weakest by considering a benchmarking of the average 2.75. This

approach assists in presenting IT Governance gaps and recommendations within the organisations studied in the Public Sector.

7.4. IT Governance maturity in Kingdom of Bahrain

The President of the Central Informatics Organisation recently announced that Bahrain adopts Information Technology Governance regardless of the use of COBIT 5 or any other frameworks (Chapter, 2014). The result obtained in this research indicates that IT Governance maturity is 2.75. This also shows that when mapping the result of IT Governance maturity in the Kingdom of Bahrain to the COBIT 4.1 maturity model, it is comparatively close to *Defined Process* level. Accordingly, the comparison of this result of the public sector organisations studied to benchmark the status with others shows that it is comparatively similar to the International standards guidelines and industry best practices as mentioned in the work of (Van Grembergen et al., 2004) and the COBIT 4.1maturity model (ITGI, 2007). The defined process level situates a direction for the organisations to strive to reach a higher maturity level. Several constructs can be elicited from this current level studied in the five public organisations (MoE, MoH, MoW, UoB and MoI); these can be summarised as follows:

- Management understand the need for the IT Governance Implementation Act.
- There exist use of practices, policies and procedures.
- Organisations are planning to purchase tools to automate processes.
- Organisations are aware of skills requirements and training plans development, however it is still dependent on the individual initiative.
- Responsibilities are defined, yet accountability is not practiced fairly.
- Knowledge, Leadership and Decision-making; these terms must be identified, practiced and communicated in public sector organisations.

The study classified the results into process less than the average to demonstrate the available gaps within IT Governance performance and to achieve an in-depth insight into these existing gaps. The results were presented in Chapter Six: Data Analysis and Results, and summarised in Figure 7.1 : Processes with results below average in the five studied organisations and

further illustrated in Table 7.1: Summary of weakest processes in the five studied organisations.

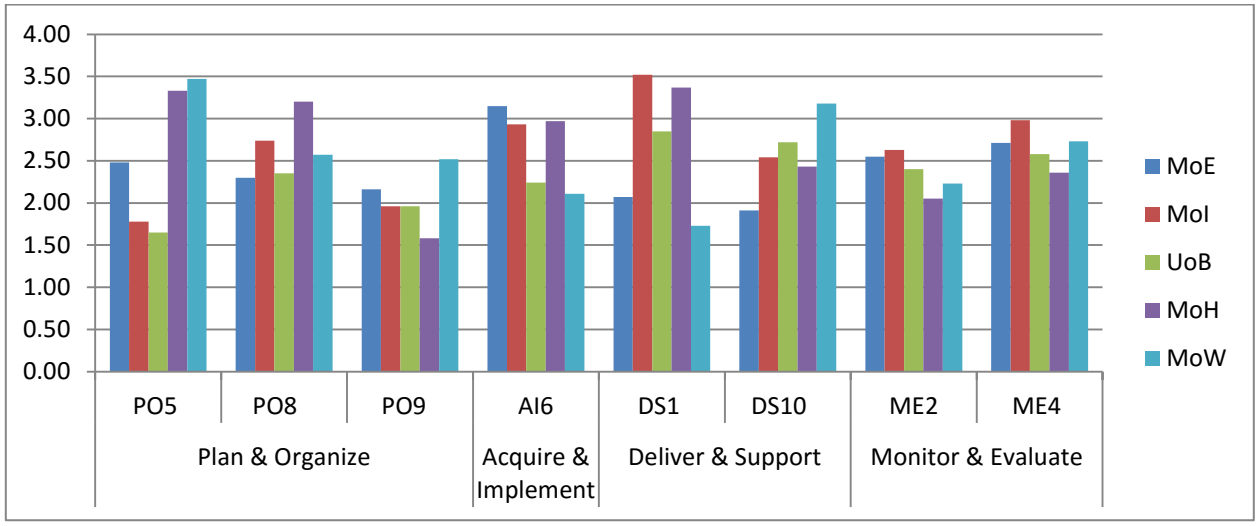

Figure7.1: Processes with results below average in the five studied organisations

Figure7.1 shows placing the processes into COBIT 4.1 focus areas and indicates that three processes from Plan and Organize (PO5, PO8, PO9), one process from Acquire and Implement (A16), two processes from Deliver and Support (DS1, DS10) and two processes from Monitor and Evaluate (ME2, ME4) obtained results below the average 2.75.

Table 7.1: Summary of weakest processes in the five studied organisations, summarises the main points found to hamper the appropriate use of IT in the five organisations. Placing accountability in the SHIP-ITG model is important for using IT resources responsibly. The responsible use of IT resources is driven by national level factors (Gheorghe, 2010). In fact, these are legal aspects and IT related laws. Further investigation into the process to understand how can promote accountability within IT activities and operations found in contracts and service level agreements. The agreements are applied to external service providers and rarely applied internally for quality and timely IT services delivered to users (Peterson, 2000a). However, contractual and service levels are reviewed by an external and dedicated organisation. The Legislation and Legal Opinion Commission expresses an opinion to all the ministries and public institutions with raised legal issues or enters into a contract on the subject. The contracts department express an opinion on contracts subject to the law

regulating tenders and auctions and government procurement and sales, in connection with raised legal issues (Referendum, 2014b).

Process description as in COBIT 4.1	**Gaps within Practice analysis across the studied five organizations**
P05: Manage the IT Investment	• Tracking or monitoring of IT investments and expenditures. • Identify the return on investment criteria (ROI) in public sector. • Increase communications for better understanding of the need to manage IT investments.
PO8: Manage Quality	• Projects need review for quality identifications. • Require formal judgments on quality. • Plans for quality training discipline. • Requires tools for quality management.
PO9: Assess and Manage IT Risks	• Requires a specific structure for managing risks and conducting formal assessments of project risk. • Requires proper risk mitigating processes.
A16: Manage Changes	• Informal change management process in place. • Workaround take place and processes often bypassed.
DS1: Define and Manage Service Levels	• Accountability and responsibilities for monitoring service levels are not assigned. • Service level reporting is a missing process and needs skills and initiatives from managers. • Service levels still do not address business needs.
DS10: Manage Problems	• The service level to user community varies because of the insufficient structural knowledge available. • There are limited process for identification and resolution of incidents.
ME2: Monitor and Evaluate Internal Control	• Organisations use informal control reports to imitate corrective actions. • Needs regular monitoring for critical internal controls. • Risk factors of specific IT environments are identified based on skills of individuals. • Require a self-assessment and internal control assurance review roles.
ME4: Provide IT Governance	• Responses to incidents are reactive as preventing loss or embarrassment to the organization. • Improvements on IT processes are dependable on individuals. • IT Governance measurements and assessment methods are identified but not adopted.

Table7. 1: Summary of weakest processes in the five studied organisations

The aim of this review is to ensure that the supplier will adhere to implement all terms of the contract during the period of the contract and in the event of failing to implement will give compensation for this breach of contract as collateral for the rights of the government entity. This also ensures the existence of text in the contract for the punitive fines imposed against the supplier in case of breach of contract with the government agency. Therefore, IT Governance focuses on broader objectives than the financial part of IT investments. These contracts and service levels are used for enforcing internal controls, directions and promoting accountability and ensuring that IT assets are used optimally. An important argument states that the financial performance might be an accurate measure when investigating IT performance and suggested broader benefits arising from organisational performance, such as operations, product delivery, customer services and staff (Pervan and Maimbo, 2007).

Another important accountability driver found is within the human resources element. People are an important part of the IT Governance concept and this view has been presented and debated by previous researchers as explained in Chapter Six. Authors have pointed out that IT Governance is "the decision making and accountability framework for encouraging desirable behaviour in the use of IT" (Ross and Weill, 2004b). The challenge the IT Manager/Director faces is how to best articulate governance agendas in practice (Grant et al., 2007). However, Prased pointed out that IT Governance is a coordinated effort and must embrace all levels of human resources in implementing IT Governance initiatives (Prasad et al., 2010). Another considerable study concerning IT Governance priorities found that both literature and practitioners agree people and goals are the most important concerns for IT Governance (Simonsson and Ekstedt, 2006). Therefore, responsibility is on the IT Director/Manager who must put effort in building relationships in the entire organisation and act in a proactive manner and move to strategic IT leadership (Broadbent, 2003); with the use of an appropriate and effective set of processes and procedures. The importance of human resources within IT governance reaches the lower levels of the IT Directors. The skills and knowledge are critical assets for effective IT Governance. This is to emphasise transparency and the need to encourage lower level managers to accept responsibility for effective IT use (Ross et al., 2004).

In fact, it has been noted that the majority of the five studied organisations understand that IT Governance did not work independently and requires linking back to the corporate governance and overall organisational strategy. This view was in line with the literature and emphasises the relationship and alignment and the wider context of corporate governance (Denise and Dieter, 2010, Grembergen, 2004a). IT structure was found to be different within the five organisations practices, both in the organisational structure and steering committees. However, structures only make the roles clear but the relationships can make the structure transparent. Roles and responsibilities can be easily defined, yet a major need is for commitment to be actively involved in IT practice. Therefore, organisations require an awareness to understand that IT Governance is a shared responsibility and shared governance depends on people more than structure. The contributed IT Governance model in this research offers a simple and dynamic model for organisations to adopt and for understanding the main elements they need to focus on. The model does not force implementing the concept in a certain way, rather more to understand and select the appropriate methods. The model ensures that responsibilities differ from accountability; responsibilities can be shared between individuals, but accountability cannot.

7.5. The effectiveness of using COBIT Maturity Model

The COBIT Maturity Model is a well-known IT Governance tool used for measuring how well developed the management processes are with respect to internal controls (Pederiva, 2003). An interesting feature of the maturity model is the opportunity of allowing an organisation to measure their achievements and define their responsibilities. The use of the COBIT maturity model within the five organisations studied provided a serviceable insight into key success factors and barriers of adopting IT Governance in the public sector. This was very helpful for the organisation striving for more mature strategic alignment processes by scoring and grading (measure). The goal of identifying barriers and gaps is to increase the maturity of the processes and facilitate compliance to regulatory demands (define). The model considered a basic tool for the researcher as well as for getting insights into IT Governance practice by exploring the selected 18 processes of the COBIT 4.1 Framework.

Individual reports were given for each organisation which was then discussed with the appropriate IT Director.

The research sample covered different job levels from IT Director to Technical support, therefore the concept of IT Governance was found to be confused within IT Management. This also proves that organisations were adopting IT Governance regardless of the use of any framework; however, introducing the COBIT Framework to the samples studied had some influence. Within the practical work, using COBIT assessment tables illustrated above, showed a reasonable inherently a raised awareness and motivation for further improvements because the discussion captured the management consensus and provided the opportunity for self-grading. Therefore, it has proven that the questionnaire enabled the organisations studied to identify the points preventing them from reaching a better maturity.

7.6. The adoption of the conceptual model

Previous studies have found that a proper understanding of IT Governance is often still lacking (Denise and Dieter, 2010, Grant, 2005, Robinson, 2005). Therefore, authors admit that research into IT Governance is incomplete and encourage continuing exploring this concept for finding appropriate mechanisms to govern corporate IT decisions (Denise and Dieter, 2010). Thus, the IT Governance topic attracted both practitioners and researchers to develop IT Governance frameworks and maturity models to assess organisations on evaluating and planning for improvements. The most significant of all initiatives into the IT Governance domain was that they were developing the holistic nature of this concept. This view further demonstrated in Brawn and Grant (Grant, 2005) pointed to the term “IT Governance Forms” and dealt with decision making structures within IT organisations.

The effectiveness of IT Governance impacts the organisational performance (Mohamed and Singh, 2012). IT Governance performance can be defined from the business point of view as the quality of services an IT organisation delivers. In reviewing the literature, researchers pointed to the association of internal IT organisational efficiency, the external effectiveness of services delivered and emphasized the correlation of IT Governance maturity with IT Governance performance (Simonsson et al., 2010).

The findings of this research study seem to be consistent with other research that found that effective governance requires the harmonization of business objectives, IT Governance style and business performance goals (Weill and Woodham, 2002). Therefore, the proposed conceptual model illustrated in Chapter Four of this research study provides the organisation with a simple and dynamic model to adopt and understand the main bond elements that need to be focused upon. The model is a tool for the IT Directors and top management to clarify relationships and commitments in IT decision-making. The model can be implemented regardless of any structure because the effectiveness of IT steering committees drives the IT Governance initiative positively (Prasad et al., 2010). Yet, it is crucial to benchmark the current maturity for organisations seeking further improvements: "You cannot manage what you don't measure"- Peter Drucker.

7.7. Key factors for a successful IT Governance

This study produced results which corroborate the findings of previous work in this field. Previous research encouraged examining organisational activities and the mechanisms necessary for effective implementation of IT Governance in the public sector (Sethibe, 2007). The study confirms that IT Governance is practiced through leadership capabilities and requires understanding of its main elements and requires a set of relationships between these elements for effective IT Governance in practice. The findings support that IT Governance necessitates control and accountability (Webb et al., 2006). The findings of this study suggest that:

- IT Governance is mainly related to IT decision-making authority. This depends on capability of the organisation and the role of the steering/Governance committee.
- Accountability is an important part in IT Governance especially since the organisations are non-profit and IT projects are considered important.
- Although organisations share more or less the same characteristics, they have different IT Governance maturity levels.
- The selected organisations are partially aware of most parts of maturity level statements.

- IT Governance is specific for the organisation and is the responsibility of the Top Management and IT Director to give a direction to take control over IT.

In fact, the study suggested that IT Governance is influenced by different elements that are interconnected. Therefore, an effective IT Governance Practice in the public sector can be defined through a number of key factors suggested from this study:

❖ Define responsibility charting (RACI) and approvals.

As stated above, COBIT provides benchmarking for assessing the current performance state and leads to defining the desired planned performance. Therefore, defining responsibility charting at the stage of determining the tactical plan is an important technique for identifying functional areas, activities and decision points for which the role is responsible, accountable, consulted or informed (RACI).

❖ Gap Analysis

The organisation should periodically review the strategic IT planning to ensure the organization's direction and its current standing. This is performed by outlining the end goals, mapping out the approach to these goals and considering the important gaps between the current stance and the target performance; also to ascertain which steps can bridge these breaks. Gap analysis benefits can be summarized as follows:

- Provide a clear vision of where the organisation is standing and where it intends to go.
- Determines the flaws in resource allocation, planning and production.

❖ Measure and define.

Assessing the maturity of the organisation on performing their IT activities is a critical point when striving for enhanced performance. When measuring the current maturity level, the organisation can further plan for activities and define roles and responsibilities.

❖ Collaborate and Share Governance.

The adoption of IT Governance is a shared responsibility and practiced at a corporate level through defined committees.

7.8. Challenges and Difficulties

Throughout the research process, a number of difficulties are overcome and addressed in the next paragraphs:

- Communication with participants: one case study permitted contacting one person only without direct contact with participants. Some information about survey participants remains confidential to protect their identity and eight responses were communicated through the coordinator. In this particular case study, the coordinator adopted a protocol to communicate with the selected team accordance with my research requirements. Detailed explanation of the protocol was provided to the coordinator and further answers were provided when needed.

- The online assessment form developed by the researcher was considered a solution for both case studies as the participants failed to comply with the appointments scheduled and the online version was less time consuming; however, they preferred the face-to face interviews.

- Mendeley software was used in this research for generating a database of the literature covered during the research journey. This database can be considered the only search engine or analysis method for the researcher in investigating the literature for specific words, for instance in building the conceptual model references as shown in Chapter Four.

- Massive data: The researcher adopted case study research in five organisations and covered 62 participants. The data collection was based on using a tool developed by the researcher and for 18 selected COBIT 4.1 processes. This produced intensive data and was time consuming for reconsidering the best way to present it in a meaningful manner.

7.9. Research Contributions

The major outcomes derived from this research are summarized below:

- Reviewing the normative literature in IT Governance and the COBIT 4.1 maturity model in general revealed significant complexity in identifying appropriate models of IT Governance in the public sector. Particular gaps identified how the dynamics and the character of governance relationships are enacted in practice. IT Governance conceptual model (see Figure 4.6: SHIP-ITG Model) has been proposed to fill gaps between literature and practice. The model confirmed the importance of structure, process and relational mechanisms and thus required rearrangements, combining new concepts and interconnections to reveal a dynamic and simple model. Therefore, IT Governance conceptual model contributes to the theory and knowledge base and a few practical relations will further increase the utility of previous models.

- Maturity criteria with SHIP-ITG Model (see Figure 4.12: SHIP-ITG Maturity Criteria). The researcher developed five levels of criteria to enable decision makers to

adopt the model. This also includes the procedures for assessing the maturity level and calculating the maturity level.

- Using a content analysis approach to a number of existing models and definitions assisted the researcher in developing the conceptualized model. Besides, the empirical practice led the researcher to propose "Human Resources" as a separate element in the model to help the decision-makers become ready to build relationships. This also led to the importance of structure that gives clarity to roles and responsibilities.

- Literature analysis and empirical results on the importance of accountability found that effective IT Governance can be practiced through contract governance. This is also consolidated with service level agreements and IT-related policies. The empirical evidence verified the requirement for using IT Resources responsibly. This research area is vital and not contained within the previous models.

- COBIT 4.1 maturity model was used as a method for collecting empirical data. Hence, it required intensive effort to prepare the questionnaires for the selected 18 COBIT 4.1 processes. MS Excel was used for developing the questionnaire, data calculations and producing figures. Online questionnaire was used to communicate with participants via emails and demonstrate the figures of the respondents. The researcher adopted a previously used algorithm to calculate the processes maturity level. The researcher used MS Excel functions to perform and facilitate the calculation process. This work can be customized to adopt further COBIT processes to be used by the organisation to scale its maturity improvements.

- The researcher studied five government organisations located in the Kingdom of Bahrain as multiple case studies. The selection of the case studies was based upon criteria of willingness to cooperate and availability of multiple source of information. The researcher experienced active involvement of IT staff to the concept of IT Governance. This practice enabled the researcher to get insights into the selected IT

processes and offered the organisation a holistic view of IT Governance improvements. The researcher classified the results into two categories: strong and weak, to determine suggestions for further improvements. This research domain has not been under study in IT Governance practice.

- Empirically, the developed assessment maturity questionnaire was used for the five case public organisations based in the Kingdom of Bahrain: MoE, MoI, MoH, UoB and MoW. This enabled organisations to better understand, implement, evaluate and manage IT Governance for their business success. This implementation was found to be an appropriate tool to identify the IT Governance maturity level.

- The maturity levels related to IT processes in and across the studied organisations. The overall maturity provided a valid possibility for further research and comparison with other public sector organisations in Bahrain and internationally from a range of nations. This benchmark has not previously been available and thus adds to the knowledge base and to IT Governance practices.

- Based on the empirical implementation, a novel empirical taxonomy was generated from benefits and barriers to the organisations' practice. The results reported helped the decision-making process in the studied organisation to plan and adopt IT Governance. One example is issuing a ministerial order to form an ICT Government Committee. Another is providing IT Governance awareness through training; for example Innovation Leadership in IT to retain, strengthen and sustain IT capabilities. Consequently, more attention is given to the importance of Human Resources. Therefore, the research contributes to practice.

The above outcomes informed the researcher to propose a number of novel contributions in the IT Governance domain. In addressing the void in the literature regarding IT Governance in the public sector, and developing an IT Governance model that outlines the main elements and interconnections process in practice for government organisations, the researcher proposed four novel contributions.

- **A Novel Model for IT Governance adoption:** This concerns the major contribution of this research based on the empirical work that provides comprehensive insights into IT Governance practice in the public sector. The model consolidated a set of concepts, namely elements and interconnections (see Chapter Four). The model seeks to provide a reference for IT Directors and the overall organisation to critically focus on issues regarding the effective implementation of IT Governance. Each organisation can implement the IT Governance model in a manner most appropriate to their environment.

- **A Novel taxonomy for IT Governance barriers and benefits**: Although the literature has indicated theoretically the barriers of IT Governance and benefits of its adoption, the contribution of this research has validated both barriers and benefits through the novel empirical taxonomy and the empirical results. The findings confirmed some barriers and benefits as shown in Chapter Six, and derived new barriers and benefits as presented in Chapter Seven. An empirical taxonomy of organisational awareness was noted in the adoption of IT Governance research, such as the collaboration and IT decision-making through committee responsibilities. This also allowed decision-makers to consider the importance of Human Resources and develop leadership skills training.

- **The maturity criteria for adopting the SHIP-ITG model**: The organisation will understand the concept of the SHIP-ITG model and then can adopt the five level criteria (from level 1 to level 5) to assess and calculate its maturity level. Each maturity level is composed of four parts (Strategic objectives, process, IT resources and human resources).

- **IT Governance through Contract Governance:** This is an important contribution since there was an absence of literature regarding how accountability can be practiced in the IT domain. The previous literature stressed the importance of accountability and its relation to encourage desirable

behaviour in the use of IT, IT Governance driven by embedding accountability into the enterprise, and accountability designed in a given process. However, the literature did not mention the contract mechanism to demonstrate this accountability. The empirical practice enabled the researcher to identify the significant role of contracts in managing and using IT Resources.

7.10. Research Limitations

The SHIP-ITG Model presented in Chapter Four represents a foundation for future research in adopting IT Governance. It can be used as a background theory for researchers. A limitation of this proposed research is the geographical area where it was conducted and the number of government organisations interviewed. Although the current study is based on a small sample of participants, the findings make some noteworthy contributions towards enhancing the context of IT Governance in the Kingdom of Bahrain and highlighted some issues for improvement.

As presented in Chapter Three, the research approach for this study was qualitative with its exploratory nature of a little-known phenomenon, and this offered the researcher a route to understand and adopt the developed COBIT questionnaire to evaluate IT Governance practice through face-to-face interviewing and observations. An implication of qualitative research methods facilitated the generalization of rich contextual data associated with human and organisational issues. However, the main weakness of this method is it being time consuming in that the researcher spent time on data collection and analysis. The massive amount of data collected through the five cases was more contextual. Consequently, this made the interpretation difficult and several attempts were made to present the analysis process.

In some instances, restricted access to some participants, data and in particular government documents was one of the concerns in this research. For the case organisations, some interviewees were not able to reveal everything regarding budget and relationships with top management. Another concern is scheduling appointments with some managers and other

IT staff which were repeatedly cancelled or postponed, though this was challenging rather than a limitation.

Through the empirical practice in the case organisation, the researcher found through interviews that IT Directors were reluctant to reveal problems or negative aspects about their IT practices. Therefore, the researcher's plan succeeded in involving different job levels and experiences. Thus, this limitation was addressed by the researcher by using data triangulation to collect data from various sources.

In addition, the implementation of the COBIT assessment questionnaire received some criticisms by the respondents during the interviews conducted in this research. The general opinion is that statements were difficult to understand, complex to work with and comparatively ambitious. Thus, the researcher established an alternative communication process with respondents and encouraged them to complete the IT Governance maturity assessment. The researcher also provided explanations and further assistance if needed.

7.11. Recommendations for Further Research

The following recommendations are made for further research:

- Further work needs to be done to establish an IT Governance maturity assessment using the latest version of COBIT 5. Therefore, the researcher recommends customizing the assessment maturity questionnaires to cover the context of updated and further processes.

- Through the shortage of time, the researcher was only able to test and implement the proposed conceptual model in one public sector case study. The context of this research was characterized by small geographical area and comparatively low population, therefore, a number of possible future studies using the same model setup is apparent. It would be interesting to assess the model within different sectors, such as the private sector.

- Further research might investigate alternative algorithms for calculating IT Governance maturity levels. It would be useful to retest the algorithm identified in this research to determine if it has the same impact or less significance.

7.12. Conclusion

The literature review carried out during this research journey revealed a considerable volume of published research regarding the concept of IT Governance and associated frameworks together with diagnosing complex relationships between the IT department and the rest of the business (Peppard, 2001, Peppard, 1999, Denise and Dieter, 2010, Mohamed and Singh, 2012). Researchers have shown an increased interest in strategic planning and SWOT analysis (strength, weakness, opportunities and threats) and the significance of using this technique in determining the internal strengths and weaknesses, therefore making the adjustments to avoid threats and to find the opportunities (Gretzky, 2010, Houben et al., 1999, Dyson, 2004). In order to understand the maturity results, benchmarking is fundamental for comparative analysis and for drawing conclusions. This research study classified the maturities of the selected 18 processes with the average result benchmark into strongest and weakest processes. This will provide invaluable recommendations on how to improve IT Governance maturity in public sector organisations.

The positive aspect of this research is performing a validation test for the SHIP-ITG model with the assessment criteria in one case study and calculating the maturity result as illustrtated in Chapter Three and provided results in Appendix D.

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Appendix A: Case Study Protocol

Field Work Procedure

1. Gaining access to interviewees: Since it has been considered in selecting the case organisations to have a good contact, organisations have assigned a coordinator to facilitate communication and arrangements between the researcher and the interviewees.

2. Defining who should be interviewed (Research Sampling Strategy): The investigation of IT Governance Practice is in this research related to information technology and therefore the interviewees should be within the scope of the IT domain. However, the researcher attempted to coordinate with each case organisation through providing a commitment first from someone senior to be able to assist with other interviewees when needed. Then, the researcher was requested to assign a coordinator to facilitate obtaining any necessary information about IT employees that would fit within this research study.

3. Identify appropriate data gathering methods: The plan at the beginning of this research study was to use personal interview as a core method for data collection, thus the researcher developed an interview agenda that could be used to collect data from the interviewees during the semi-structured interviews and structured interviews when the COBIT assessment tool was used. However, the researcher developed an online method of collecting data that would preserve the data in a database.

4. Having sufficient resources while in the field: The researcher should be well prepared prior to the data collection for fieldwork; such as the writing instruments or forms, stationary, note paper to record any necessary comments and observations. It is beneficial also to hold a good performance digital recorder and the interviewee's

consent is an important agreement that must be considered prior recording. In addition, the researcher requires a quiet place to conduct the interviews and to write notes privately; hence these factors have been considered in this research study. To illustrate, some interviewees share the same space with more than one colleague and it would be difficult to discuss and take notes.

5. Make an interview schedule: This procedure is to make a clear schedule for each case study of the data collection activities that are expected to be completed within a specified period of time. The researcher has requested an hour for each interview for this research study. This arrangement should be addressed some days before meeting and the time confirmed with the interviewee within the same day to avoid any misunderstanding or conflict of unexpected events; thus the researcher should be prepared in advance to arrange for another interviewee when possible.

6. Confidentiality of research: It is an important procedure to gain interviewee confidence by establishing and explaining the confidentiality concerns of research; therefore information disclosed would not be presented using the participant's identity. The researcher asked the interviewee to describe his/her main roles and responsibilities as part of an IT community within the case study. This is to validate the prior assigned topics, as a part of the COBIT assessment tool for the interviewee and communicated by the coordinator. Thus, the researcher considered the protection of human subjects by gaining informed consent from all participants in the case studies and also explained the protection of confidentiality of those participants.

Participant Information Sheet

Title of study: IT Governance Practice in Kingdom of Bahrain

Researcher: Leena Ali Janahi, Salford Business School, University of Salford, Greater Manchester, UK.

I am a PhD student in Salford Business School. As part of this degree I am undertaking a research leading to a thesis. This research is to investigate IT governance practice in Kingdom of Bahrain in both private and government sectors to investigate the benefits and barriers of IT Governance. It has been considered in the nominated organisations to be within large size organizations that conduct a strategy for the use and invest in IT, have a good reputation and outcomes for its services, provide in-house developments for systems and training. The University requires that ethics approval be obtained for research involving human participants.

I will approach CIO's and IT Directors/Managers with a number of staffs, which be nominated by their roles. The number of participants is yet undecided at this stage but it is anticipated that up to 10(plus) from each organisation. I expect to interview a gender blend. This will depend upon the board/organizational structure and nature of the recruitment rational. Participants will be asked to answer questions. It is envisaged that the interview will take about two hours to complete.

Should any participants feel the need to withdraw from the research, they may do so without question at any time before the data is analyzed. Just let me know at the time.

Responses collected will form the basis of my research and will be put into a written report on an anonymous basis. It will not be possible for you to be identified personally. All material collected will be kept confidential. No other person besides me, my supervisor, Dr Marie Griffiths at University of Salford and my advisor Dr Hesham Al-Ammal at University of Bahrain, will see the data. Data collected will be destroyed five years after the end of the research.

If you have any questions or would like to receive further information about this research, please contact me via email l.a.janahi@gmail.com or phone 39403035.

Leena Ali Janahi
Signed:

General: IT Governance Practice in Kingdom of Bahrain

1) Name (optional)

_____

2) Organisation

_____

3) Title

_____

4) (CONSENT TO PARTICIPATION IN RESEARCH)-- I have been given and have understood an explanation of this research. I have had an opportunity to ask questions and have them answered to my satisfaction. I understand that I may withdraw myself (or any information I have provided) from this research (before data collection and analysis is complete) without having to give reasons. I understand that any information I provide will be kept confidential to the researcher, the supervisor and advisor, the published results will not use my name, and that no opinions will be attributed to me in any way that will identify me.

[ ] I agree to take part in this research

[ ] I understand that the data I provide will not be used for any other purpose or released to others without my written consent.

[ ] I understand that I will have an opportunity to check the transcripts of the interview before publication.

[ ] I consent to information or opinions which I have given being attributed to me in any reports on this research.

5) Are you familiar of IT Governance concept?

( ) Yes

( ) No

6) Do you think there is a tangible benefit of implementing IT Governance?

( ) Yes

( ) No

7) What IT Governance frameworks have been experinced?

( ) COBIT

( ) ITIL

( ) ISO/IEC 27002

( ) OTHERS (please specify in the available box below)

8) In your opinion, is there a link between IT Governance and Corporate Governance?

( ) Yes

( ) No

9) Are you interested in discovering your IT Governance maturity level?

( ) Yes

( ) No

10) Is there a responsible body about IT decisions in your organisation?

( ) Not specific

( ) Steering committee

( ) Mandate

( ) others (please explain in the available box below)

11) What is the amount spent on IT compared to the enterprise's entire budget?

_____

12) What is the percentage of budget spent on IT compared to the industry average? How has it evolved over the year?

_____

P01: Define a Strategic IT Plan

---

1) P01.0: IT strategic planning is not performed. There is no management awareness that IT strategic planning is needed to support business goals. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) P01.1: The need for IT strategic planning is known by IT management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) P01.1: IT planning is performed on an as-needed basis in response to a specific business requirement. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) P01.1: IT strategic planning is occasionally discussed at IT management meetings. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) P01.1: The alignment of business requirements, applications and technology takes place reactively rather than by an organisation wide strategy. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) P01.1: The strategic risk position is identifined informally on a project-by-project basis. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) P01.2: IT strategic planning is shared with business management on an as needed basis. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) P01.2:Updating of the IT plans occurs in response to requests by managemnt. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) P01.2: Strategic decisions are driven on a project-by-project basis without consistency with an overall organisation strategy. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) P01.2: The risks and user benefits of major strategic decisions are recognised in an intuitive way. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) P01.3: A policy defines when and how to perform IT strategic planning. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) P01.3: IT strategic planning follows a structured approach that is documented and known to all staff. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) P01.3: The IT planning process is reasonably sound and ensures that appropriate planning is likely to be performed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) P01.3: Discretion is given to individual managers with respect to implementation of the process, and there are no procedures to examine the process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) P01.3: The overall IT strategy includes a consistent definition of risks that the organisation is willing to take as an innovator or follower. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) P01.3: The IT financial, technical and human resources strategies increasingly influence the acquisition of new products and technologies. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) P01.3: IT strategic planning is discussed at business management meetings. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) P01.4: IT strategic planning is standard practice and exceptions would be noticed by management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) P01.4: IT strategic planning is a defined management function with senior-level responsibilities. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) P01.4: Management is able to monitor the IT strategic planning process, make informed decisions based on it and measure its effectiveness. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) P01.4: Both short-range and long-range IT planning occurs and is cascaded down into the organisation, with updates done as needed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) P01.4: The IT strategy and organisation wide strategy are increasingly becoming more co-ordinated by addressing business processes and value-added capabilities and leveraging the use of applications and technologies through business process re-engineering. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) P01.4: There is a well-defined process for determining the usage of internal and external resources required in system development and operations. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) P01.5:IT strategic planning is a documented, living process; is continuously considered in business goal setting; and results in discernible business value through investments in IT. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

PO3: Determine Technological Direction

---

1) P03.0: There is no awareness of the importance of technology infrastructure planning for the entity. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) P03.0: The knowledge and expertise necessary to develop such a technology infrastructure plan do not exist. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) P03.0: There is a lack of understanding that planning for technological change is critical to effectively allocate resources. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) P03.1: Management recognises the need for technology infrastructure planning. Technology component developments and emerging technology implementations are ad hoc and isolated. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) P03.1: Technology directions are driven by the often contradictory product evolution plans of hardware, systems software and applications software vendors. Communication of the potential impact of changes in technology is inconsistent.How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) P03.2: The need for and importance of technology planning are communicated. Planning is tactical and focused on generating solutions to technical problems, rather than on the use of technology to meet business needs. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) P03.2: Evaluation of technological changes is left to different individuals who follow intuitive, but similar, processes. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) P03.2: People obtain their skills in technology planning through hands-on learning and repeated application of techniques. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) P03.2: Common techniques and standards are emerging for the development of infrastructure components. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) P03.3: Management is aware of the importance of the technology infrastructure plan. The technology infrastructure plan development process is reasonably sound and aligned with the IT strategic plan. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) P03.3: The e is a defined, documented and well-communicated technology infrastructure plan, but it is inconsistently applied. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) P03.3: The technology infrastructure direction includes an understanding of where the organisation wants to lead or lag in the use of technology, based on risks and alignment with the organisation's strategy. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) P03.3: Key vendors are selected based on the understanding of their long-term technology and product development plans, consistent with the organisation's direction. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) P03.3: Formal training and communication of roles and responsibilities exist. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) P03.4: Management ensures the development and maintenance of the technology infrastructure plan. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) P03.4: IT staff members have the expertise and skills necessary to develop a technology infrastructure plan. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) P03.4: The potential impact of changing and emerging technologies is taken into account. Management can identify deviations from the plan and anticipate problems. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) P03.4: The human resources strategy is aligned with the technology direction, to ensure that IT staff members can manage technology changes. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) P03.4: Migration plans for introducing new technologies are defined. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) P03.4: Outsourcing and partnering are being leveraged to access necessary expertise and skills. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) P03.4: Management has analysed the acceptance of risk regarding the lead or lag use of technology in developing new business opportunities or operational efficiencies. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) P03.5: A research function exists to review emerging and evolving technologies and benchmark the organisation against industry norms. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) P03.5:The direction of the technology infrastructure plan is guided by industry and international standards and developments, rather than driven by technology vendors. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) P03.5: The potential business impact of technological change is reviewed at senior management levels. There is formal executive approval of new and changed technological directions. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

PO5: Management the IT Investment

---

1) P05.0: There is no awareness of the importance of IT investment selection and budgeting. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) P05.0: There is no tracking or monitoring of IT investments and expenditures. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) P05.1: The organisation recognises the need for managing the IT investment, but this need is communicated inconsistently. Allocation of responsibility for IT investment selection and budget development is done on an ad hoc basis. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) P05.1: Isolated implementations of IT investment selection and budgeting occur, with informal documentation. IT investments are justified on an ad hoc basis. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) P05.2: There is an implicit understanding of the need for IT investment selection and budgeting. The need for a selection and budgeting process is communicated.How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) P05.2: Compliance is dependent on the initiative of individuals in the organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) P05.2:There is an emergence of common techniques to develop components of the IT budget. Reactive and tactical budgeting decisions occur. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) P05.3:Policies and processes for investment and budgeting are defined, documented and communicated, and cover key business and technology issues. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) P05.3: The IT budget is aligned with the strategic IT and business plans. The budgeting and IT investment selection processes are formalised, documented and communicated. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) P05.3: Formal training is emerging but is still based primarily on individual initiatives. Formal approval of IT investment selections and budgets is taking place. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) P05.3: IT staff members have the expertise and skills necessary to develop the IT budget and recommend appropriate IT investments.How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) P05.4: Responsibility and accountability for investment selection and budgeting are assigned to a specific individual. Budget variances are identified and resolved. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) P05.4: Formal costing analysis is performed, covering direct and indirect costs of existing operations, as well as proposed investments, considering all costs over a total life cycle. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) P05.4: A proactive and standardised process for budgeting is used. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) P05.4: The impact of shifting in development and operating costs from hardware and software to systems integration and IT human resources is recognised in the investment plans. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) P05.4: Benefits and returns are calculated in financial and non-financial terms. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) P05.5: Industry good practices are used to benchmark costs and identify approaches to increase the effectiveness of investments. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) P05.5: Analysis of technological developments is used in the investment selection and budgeting process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) P05.5: The investment management process is continuously improved based on lessons learned from the analysis of actual investment performance. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) P05.5: Investment decisions incorporate price/performance improvement trends. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) P05.5: Funding alternatives are formally investigated and evaluated within the context of the organisation's existing capital structure, using formal evaluation methods. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) P05.5: An analysis of the long-term cost and benefits of the total life cycle is incorporated in the investment decisions. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

P07: Manage IT Human Resources

---

1) P07.0: There is no awareness about the importance of aligning IT human resources management with the technology planning process for the organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) P07.0: There is no person or group formally responsible for IT human resources management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) P07.1: Management recognises the need for IT human resources management. The IT human resources management process is informal and reactive. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) P07.1: The IT human resources process is operationally focused on the hiring and managing of IT personnel. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) P07.1: Awareness is developing concerning the impact that rapid business and technology changes and increasingly complex solutions have on the need for new skills and competence levels. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) P07.2: There is a tactical approach to hiring and managing IT personnel, driven by project-specific needs, rather than by an understood balance of internal and external availability of skilled staff. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) P07.2:Informal training takes place for new personnel, who then receive training on an as-required basis. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) P07.3:There is a defined and documented process for managing IT human resources. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) P07.3: An IT human resources management plan exists. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) P07.3: There is a strategic approach to hiring and managing IT personnel. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) P07.3: A formal training plan is designed to meet the needs of IT human resources. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) P07.3:A rotational programme, designed to expand technical and business management skills, is established. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) P07.4: Responsibility for the development and maintenance of an IT human resources management plan is assigned to a specific individual or group with the requisite expertise and skills necessary to develop and maintain the plan. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) P07.4: The process of developing and managing the IT human resources management plan is responsive to change. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) P07.4: Standardised measures exist in the organisation to allow it to identify deviations from the IT human resources management plan, with specific emphasis on managing IT personnel growth and turnover. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) P07.4: Compensation and performance reviews are being established and compared to other IT organisations and industry good practice. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) P07.4: IT human resources management is proactive, taking into account career path development. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) P07.5: The IT human resources management plan is continuously being updated to meet changing business requirements. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) P07.5: IT human resources management is integrated with technology planning, ensuring optimum development and use of available IT skills. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) P07.5: The IT human resources management is integrated with and responsive to the entity's strategic direction. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) P07.5: Components of IT human resources management are consistent with industry good practices, such as compensation, performance reviews, participation in industry forums, transfer of knowledge, training and mentoring. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) P07.5: Training programmes are developed for all new technology standards and products prior to their deployment in the organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

P08: Manage Quality

---

1) P08.0: The organisation lacks a QMS planning process and a system development life cycle (SDLC) methodology. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) P08.0: Senior management and IT staff members do not recognise that a quality programme is necessary. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) P08.0: Projects and operations are never reviewed for quality. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) P08.1: There is a management awareness of the need for a QMS. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) P08.1: The QMS is driven by individuals where it takes place. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) P08.1: Management makes informal judgements on quality. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) P08.2: A programme is being established to define and monitor QMS activities within IT. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) P08.2:QMS activities that do occur are focused on IT project- and process-oriented initiatives, not on organisationwide processes. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) P08.3: A defined QMS process is communicated throughout the enterprise by management and involves IT and end-user management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) P08.3: An education and training programme is emerging to teach all levels of the organisation about quality. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) P08.3: Basic quality expectations are defined and are shared amongst projects and within the IT organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) P08.3: Common tools and practices for quality management are emerging. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) P08.3: Quality satisfaction surveys are planned and occasionally conducted. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) P08.4: The QMS is addressed in all processes, including processes with reliance on third parties. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) P08.4: A standardised knowledge base is being established for quality metrics. Cost-benefit analysis methods are used to justify QMS initiatives. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) P08.4: Cost-benefit analysis methods are used to justify QMS initiatives. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) P08.4: Benchmarking against the industry and competitors is emerging. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) P08.4: An education and training programme is instituted to teach all levels of the organisation about quality. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) P08.4: Tools and practices are being standardised, and root cause analysis is periodically applied. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) P08.4: Quality satisfaction surveys are consistently conducted. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) P08.4: A standardised programme for measuring quality is in place and well structured. IT management is building a knowledge base for quality metrics. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) P08.5: The QMS is integrated and enforced in all IT activities. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) P08.5: QMS processes are flexible and adaptable to changes in the IT environment. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) P08.5: The knowledge base for quality metrics is enhanced with external good practices. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

25) P08.5: Benchmarking against external standards is routinely performed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

26) P08.5: Quality satisfaction surveying is an ongoing process and leads to root cause analysis and improvement actions. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

PO9: Assess and Manage IT Risks

---

1) P09.0: Risk assessment for processes and business decisions does not occur. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) P09.0: The organisation does not consider the business impacts associated with security vulnerabilities and development project uncertainties. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) P09.0: Risk management is not identified as relevant to acquiring IT solutions and delivering IT services. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) P09.1: IT risks are considered in an ad hoc manner. Informal assessments of project risk take place as determined by each project. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) P09.1: Risk assessments are sometimes identified in a project plan but are rarely assigned to specific managers. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) P09.1: Specific IT-related risks, such as security, availability and integrity, are occasionally considered on a project-by-project basis. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) P09.1: IT-related risks affecting day-to-day operations are seldom discussed at management meetings. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) P09.1:Where risks have been considered, mitigation is inconsistent. There is an emerging understanding that IT risks are important and need to be considered. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) P09.2: A developing risk assessment approach exists and is implemented at the discretion of the project managers. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) P09.2: The risk management is usually at a high level and is typically applied only to major projects or in response to problems. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) P09.2: Risk mitigation processes are starting to be implemented where risks are identified. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) P09.3: An organisation wide risk management policy defines when and how to conduct risk assessments. Risk management follows a defined process that is documented. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) P09.3: Risk management training is available to all staff members. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) P09.3: Decisions to follow the risk management process and receive training are left to the individual's discretion. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) P09.3: The methodology for the assessment of risk is convincing and sound and ensures that key risks to the business are identified. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) P09.3: A process to mitigate key risks is usually instituted once the risks are identified. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) P09.3: Job descriptions consider risk management responsibilities. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) P09.4: The assessment and management of risk are standard procedures. Exceptions to the risk management process are reported to IT management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) P09.4: IT risk management is a senior management-level responsibility. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) P09.4: Risk is assessed and mitigated at the individual project level and also regularly with regard to the overall IT operation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) P09.4: Management is advised on changes in the business and IT environment that could significantly affect the IT-related risk scenarios. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) P09.4: Management is able to monitor the risk position and make informed decisions regarding the exposure it is willing to accept. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) P09.4: All identified risks have a nominated owner, and senior management and IT management determine the levels of risk that the organisation will tolerate. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) P09.4: IT management develops standard measures for assessing risk and defining risk/return ratios. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

25) P09.4: Management budgets for an operational risk management project to reassess risks on a regular basis. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

26) P09.4: A risk management database is established, and part of the risk management processes is beginning to be automated. IT management considers risk mitigation strategies. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

27) P09.5: Risk management develops to the stage where a structured, organisationwide process is enforced and well managed. Good practices are applied across the entire organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

28) P09.5: Guidance is drawn from leaders in the field, and the IT organisation takes part in peer groups to exchange experiences. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

29) P09.5: Risk management is truly integrated into all business and IT operations, is well accepted and extensively involves the users of IT services. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

30) P09.5: Management detects and acts when major IT operational and investment decisions are made without consideration of the risk management plan. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

31) P09.5: Management continually assesses risk mitigation strategies. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

P010: Manage Projects

---

1) P010.0: Project management techniques are not used and the organisation does not consider business impacts associated with project mismanagement and development project failures. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) P010.1: The use of project management techniques and approaches within IT is a decision left to individual IT managers. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) P010.1: There is a lack of management commitment to project ownership and project management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) P010.1: Critical decisions on project management are made without user management or customer input. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) P010.1: There is little or no customer and user involvement in defining IT projects. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) P010.1: There is no clear organisation within IT for the management of projects. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) P010.1: Roles and responsibilities for the management of projects are not defined. Projects, schedules and milestones are poorly defined, if at all. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) P010.1: Projects, schedules and milestones are poorly defined, if at all. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) P010.1: Project staff time and expenses are not tracked and compared to budgets.How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) P010.2: Senior management gains and communicates an awareness of the need for IT project management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) P010.2: The organisation is in the process of developing and utilising some techniques and methods from project to project. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) P010.2: IT projects have informally defined business and technical objectives. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) P010.2: There is limited stakeholder involvement in IT project management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) P010.2: Initial guidelines are developed for many aspects of project management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) P010.2: Application of project management guidelines is left to the discretion of the individual project manager. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) P010.3:The IT project management process and methodology are established and communicated. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) P010.3: IT projects are defined with appropriate business and technical objectives. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) P010.3: Senior IT and business management are beginning to be committed and involved in the management of IT projects. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) P010.3: A project management office is established within IT, with initial roles and responsibilities defined. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) P010.3: IT projects are monitored, with defined and updated milestones, schedules, budget and performance measurements. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) P010.3: Project management training is available and is primarily a result of individual staff initiatives. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) P010.3: QA procedures and post-system implementation activities are defined, but are not broadly applied by IT managers. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) P010.4: Management requires formal and standardised project metrics and lessons learned to be reviewed following project completion. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) P010.4: Project management is measured and evaluated throughout the organisation and not just within IT. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

25) P010.4: Enhancements to the project management process are formalised and communicated with project team members trained on enhancements. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

26) P010.4: IT management implements a project organisation structure with documented roles, responsibilities and staff performance criteria. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

27) P010.4: IT management implements a project organisation structure with documented roles, responsibilities and staff performance criteria. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

28) P010.4: Criteria for evaluating success at each milestone are established. Value and risk are measured and managed prior to, during and after the completion of projects. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

29) P010.4: Projects increasingly address organisation goals, rather than only IT-specific ones. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

30) P010.4: There is strong and active project support from senior management sponsors as well as stakeholders. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

31) P010.4: Relevant project management training is planned for staff in the project management office and across the IT function. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

32) P010.5: A proven, full life cycle project and programme methodology is implemented, enforced and integrated into the culture of the entire organisation. An ongoing initiative to identify and institutionalise best project management practices is implemented. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

33) P010.5: An IT strategy for sourcing development and operational projects is defined and implemented. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

34) P010.5: An integrated project management office is responsible for projects and programmes from inception to post-implementation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

35) P010.5: Organisation wide planning of programmes and projects ensures that user and IT resources are best utilised to support strategic initiatives. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

AI2: Acquire and Maintain Application Software

---

1) AI2.0: There is no process for designing and specifying applications. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) AI2.0: Typically, applications are obtained based on vendor-driven offerings, brand recognition or IT staff familiarity with specific products, with little or no consideration of actual requirements. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) AI2.1: There is an awareness that a process for acquiring and maintaining applications is required. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) AI2.1: Approaches to acquiring and maintaining application software vary from project to project. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) AI2.1: Some individual solutions to particular business requirements are likely to have been acquired independently, resulting in inefficiencies with maintenance and support. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) AI2.2: There are different, but similar, processes for acquiring and maintaining applications based on the expertise within the IT function. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) AI2.2: The success rate with applications depends greatly on the in-house skills and experience levels within IT. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) AI2.2: Maintenance is usually problematic and suffers when internal knowledge is lost from the organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) AI2.2:There is little consideration of application security and availability in the design or acquisition of application software. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) AI2.3: A clear, defined and generally understood process exists for the acquisition and maintenance of application software. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) AI2.3: This process is aligned with IT and business strategy. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) AI2.3: An attempt is made to apply the documented processes consistently across different applications and projects. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) AI2.3: The methodologies are generally inflexible and difficult to apply in all cases, so steps are likely to be bypassed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) AI2.3: Maintenance activities are planned, scheduled and co-ordinated. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) AI2.4: There is a formal and well-understood methodology that includes a design and specification process, criteria for acquisition, a process for testing and requirements for documentation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) AI2.4: Documented and agreed-upon approval mechanisms exist to ensure that all steps are followed and exceptions are authorised. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) AI2.4: Practices and procedures evolve and are well suited to the organisation, used by all staff and applicable to most application requirements. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) AI2.5: Application software acquisition and maintenance practices are aligned with the defined process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) AI2.5: The approach is component based, with predefined, standardised applications matched to business needs. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) AI2.5: The approach is enterprise wide. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) AI2.5: The acquisition and maintenance methodology is well advanced and enables rapid deployment, allowing for high responsiveness and flexibility in responding to changing business requirements. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) AI2.5: The application software acquisition and implementation methodology is subjected to continuous improvement and is supported by internal and external knowledge databases containing reference materials and good practices. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) AI2.5: The methodology creates documentation in a predefined structure that makes production and maintenance efficient. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

AI5: Procure IT Resources

---

1) AI5.0: There is no defined IT resource procurement process in place. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) AI5.0: The organisation does not recognise the need for clear procurement polices and procedures to ensure that all IT resources are available in a timely and cost-efficient manner. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) AI5.1: The organisation recognises the need to have documented policies and procedures that link IT acquisition to the business organisation's overall procurement process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) AI5.1: Contracts for the acquisition of IT resources are developed and managed by project managers and other individuals exercising their professional judgement rather than as a result of formal procedures and policies. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) AI5.1: There is only an ad hoc relationship between corporate acquisition and contract management processes and IT. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) AI5.1: Contracts for acquisition are managed at the conclusion of projects rather than on a continuous basis. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) AI5.2: There is organisational awareness of the need to have basic policies and procedures for IT acquisition. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) AI5.2: Policies and procedures are partially integrated with the business organisation's overall procurement process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) AI5.2:Procurement processes are mostly utilised for large and highly visible projects. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) AI5.2: Responsibilities and accountabilities for IT procurement and contract management are determined by the individual contract manager's experience. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) AI5.2: The importance of supplier management and relationship management is recognised; however, it is addressed based on individual initiative. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) AI5.2: Contract processes are mostly utilised by large or highly visible projects. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) AI5.3: Management institutes policies and procedures for IT acquisition. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) AI5.3: Policies and procedures are guided by the business organisation's overall procurement process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) AI5.3: IT acquisition is largely integrated with overall business procurement systems. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) AI5.3: IT standards for the acquisition of IT resources exist. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) AI5.3: Suppliers of IT resources are integrated into the organisation's project management mechanisms from a contract management perspective. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) AI5.3: IT management communicates the need for appropriate acquisitions and contract management throughout the IT function. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) AI5.4: IT acquisition is fully integrated with overall business procurement systems. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) AI5.4: IT standards for the acquisition of IT resources are used for all procurements. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) AI5.4: Measurements on contract and procurement management are taken relevant to the business cases for IT acquisition. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) AI5.4: Reporting on IT acquisition activity that supports business objectives is available. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) AI5.4: Management is usually aware of exceptions to the policies and procedures for IT acquisition. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) AI5.4: Strategic management of relationships is developing. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

25) AI5.4: IT management enforces the use of the acquisition and contract management process for all acquisitions by reviewing performance measurement. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

26) AI5.5: Management institutes resources' procurement thorough processes for IT acquisition. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

27) AI5.5: Management enforces compliance with policies and procedures for IT acquisition. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

28) AI5.5: Measurements on contract and procurement management are taken that are relevant to the business cases for IT acquisitions. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

29) AI5.5: Good relationships are established over time with most suppliers and partners, and the quality of relationships is measured and monitored. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

30) AI5.5: Relationships are managed strategically. IT standards, policies and procedures for the acquisition of IT resources are managed strategically and respond to measurement of the process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

31) AI5.5: IT management communicates the strategic importance of appropriate acquisition and contract management throughout the IT function. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

AI6: Manage Changes

---

1) AI6.0: There is no defined change management process, and changes can be made with virtually no control. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) AI6.0: There is no awareness that change can be disruptive for IT and business operations, and no awareness of the benefits of good change management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) AI6.1: It is recognised that changes should be managed and controlled. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) AI6.1: Practices vary, and it is likely that unauthorised changes take place. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) AI6.1: There is poor or non-existent documentation of change, and configuration documentation is incomplete and unreliable. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) AI6.1: Errors are likely to occur together with interruptions to the production environment caused by poor change management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) AI6.2: There is an informal change management process in place and most changes follow this approach; however, it is unstructured, rudimentary and prone to error. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) AI6.2: Configuration documentation accuracy is inconsistent, and only limited planning and impact assessment take place prior to a change. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) AI6.3:There is a defined formal change management process in place, including categorisation, prioritisation, emergency procedures, change authorisation and release management, and compliance is emerging. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) AI6.3: Workarounds take place, and processes are often bypassed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) AI6.3: Errors may occur and unauthorised changes occasionally occur. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) AI6.3: The analysis of the impact of IT changes on business operations is becoming formalised, to support planned rollouts of new applications and technologies. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) AI6.4: The change management process is well developed and consistently followed for all changes, and management is confident that there are minimal exceptions. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) AI6.4: The process is efficient and effective, but relies on considerable manual procedures and controls to ensure that quality is achieved. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) AI6.4: All changes are subject to thorough planning and impact assessment to minimise the likelihood of post-production problems. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) AI6.4: An approval process for changes is in place. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) AI6.4: Change management documentation is current and correct, with changes formally tracked. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) AI6.4: Configuration documentation is generally accurate. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) AI6.4: IT change management planning and implementation are becoming more integrated with changes in the business processes, to ensure that training, organisational changes and business continuity issues are addressed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) AI6.4: There is increased co-ordination between IT change management and business process redesign. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) AI6.4: There is a consistent process for monitoring the quality and performance of the change management process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) AI6.5: The change management process is regularly reviewed and updated to stay in line with good practices. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) AI6.5: The review process reflects the outcome of monitoring. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) AI6.5: Configuration information is computer-based and provides version control. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

25) AI6.5: Tracking of changes is sophisticated and includes tools to detect unauthorised and unlicensed software. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

26) AI6.5: IT change management is integrated with business change management to ensure that IT is an enabler in increasing productivity and creating new business opportunities for the organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

DS1: Define and Manage Service Levels

---

1) DS1.0: Management has not recognised the need for a process for defining service levels. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) DS1.0: Accountabilities and responsibilities for monitoring them are not assigned. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) DS1.1: There is awareness of the need to manage service levels, but the process is informal and reactive. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) DS1.1: The responsibility and accountability for defining and managing services are not defined. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) DS1.1: If performance measurements exist, they are qualitative only with imprecisely defined goals. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) DS1.1: Reporting is informal, infrequent and inconsistent. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) DS1.2: There are agreed-upon service levels, but they are informal and not reviewed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) DS1.2: Service level reporting is incomplete and may be irrelevant or misleading for customers. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) DS1.2: Service level reporting is dependent on the skills and initiative of individual managers. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) DS1.2: A service level co-ordinator is appointed with defined responsibilities, but limited authority. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) DS1.2: If a process for compliance to SLAs exists, it is voluntary and not enforced. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) DS1.3: Responsibilities are well defined, but with discretionary authority. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) DS1.3: The SLA development process is in place with checkpoints for reassessing service levels and customer satisfaction. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) DS1.3: Services and service levels are defined, documented and agreed-upon using a standard process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) DS1.3: Service level shortfalls are identified, but procedures on how to resolve shortfalls are informal. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) DS1.3: There is a clear linkage between expected service level achievement and the funding provided. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) DS1.3: Service levels are agreed to, but they may not address business needs. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) DS1.4: Service levels are increasingly defined in the system requirements definition phase and incorporated into the design of the application and operational environments. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) DS1.4: Performance measures reflect customer needs, rather than IT goals. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) DS1.4: The measures for assessing service levels are becoming standardised and reflect industry norms. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) DS1.4: The criteria for defining service levels are based on business criticality and include availability, reliability, performance, growth capacity, user support, continuity planning and security considerations. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) DS1.4: Root cause analysis is routinely performed when service levels are not met. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) DS1.4: The reporting process for monitoring service levels is becoming increasingly automated. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) DS1.4: Operational and financial risks associated with not meeting agreed-upon service levels are defined and clearly understood. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

25) DS1.4: A formal system of measurement is instituted and maintained. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

26) DS1.5:Service levels are continuously re-evaluated to ensure alignment of IT and business objectives, whilst taking advantage of technology, including the cost-benefit ratio. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

27) DS1.5: All service level management processes are subject to continuous improvement. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

28) DS1.5: Customer satisfaction levels are continuously monitored and managed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

29) DS1.5: Expected service levels reflect strategic goals of business units and are evaluated against industry norms. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

30) DS1.5: IT management has the resources and accountability needed to meet service level targets, and compensation is structured to provide incentives for meeting these targets. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

31) DS1.5: Senior management monitors performance metrics as part of a continuous improvement process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

DS4: Ensure Continuous Service

---

1) DS4.0: There is no understanding of the risks, vulnerabilities and threats to IT operations or the impact of loss of IT services to the business. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) DS4.0: Service continuity is not considered to need management attention. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) DS4.1: Responsibilities for continuous service are informal, and the authority to execute responsibilities is limited. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) DS4.1: Management is becoming aware of the risks related to and the need for continuous service. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) DS4.1: The focus of management attention on continuous service is on infrastructure resources, rather than on the IT services. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) DS4.1: Users implement workarounds in response to disruptions of services. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) DS4.1: The response of IT to major disruptions is reactive and unprepared. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) DS4.1: Planned outages are scheduled to meet IT needs but do not consider business requirements. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) DS4.2: Responsibility for ensuring continuous service is assigned. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) DS4.2: The approaches to ensuring continuous service are fragmented. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) DS4.2: Reporting on system availability is sporadic, may be incomplete and does not take business impact into account. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) DS4.2: There is no documented IT continuity plan, although there is commitment to continuous service availability and its major principles are known. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) DS4.2: An inventory of critical systems and components exists, but it may not be reliable. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) DS4.2: Continuous service practices are emerging, but success relies on individuals. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) DS4.3: Accountability for the management of continuous service is unambiguous. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) DS4.3: Responsibilities for continuous service planning and testing are clearly defined and assigned. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) DS4.3: The IT continuity plan is documented and based on system criticality and business impact. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) DS4.3: There is periodic reporting of continuous service testing. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) DS4.3: Individuals take the initiative for following standards and receiving training to deal with major incidents or a disaster. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) DS4.3: High-availability components and system redundancy are being applied. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) DS4.3: An inventory of critical systems and components is maintained. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) DS4.4: Responsibilities and standards for continuous service are enforced.The responsibility to maintain the continuous service plan is assigned. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) DS4.4: Maintenance activities are based on the results of continuous service testing, internal good practices, and the changing IT and business environment. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) DS4.4: Structured data about continuous service are being gathered, analysed, reported and acted upon. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

25) DS4.4: Formal and mandatory training is provided on continuous service processes. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

26) DS4.4: System availability good practices are being consistently deployed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

27) DS4.4: Availability practices and continuous service planning influence each other. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

28) DS4.4: Discontinuity incidents are classified, and the increasing escalation path for each is well known to all involved. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

29) DS4.4: IT Goals and metrics for continuous service have been developed and agreed upon but may be inconsistently measured. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

30) DS4.5: Integrated continuous service processes take into account benchmarking and best external practices. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

31) DS4.5: The IT continuity plan is integrated with the business continuity plans and is routinely maintained. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

32) DS4.5: The requirement for ensuring continuous service is secured from vendors and major suppliers. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

33) DS4.5: Global testing of the IT continuity plan occurs, and test results are input for updating the plan. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

34) DS4.5: Management ensures that a disaster or major incident will not occur as a result of a single point of failure. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

DS5: Ensure System Security

---

1) DS5.0: The organisation does not recognise the need for IT security. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) DS5.0: Responsibilities and accountabilities are not assigned for ensuring security. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) DS5.0: Measures supporting the management of IT security are not implemented. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) DS5.0: There is no IT security reporting and no response process for IT security breaches. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) DS5.0: There is a complete lack of a recognisable system security administration process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) DS5.1: The organisation recognises the need for IT security. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) DS5.1: Awareness of the need for security depends primarily on the individual. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) DS5.1: IT security is addressed on a reactive basis. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) DS5.1: IT security is not measured. Detected IT security breaches invoke finger-pointing responses, because responsibilities are unclear. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) DS5.1: Responses to IT security breaches are unpredictable. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) DS5.2: Responsibilities and accountabilities for IT security are assigned to an IT security co-ordinator, although the management authority of the co-ordinator is limited. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) DS5.2: Awareness of the need for security is fragmented and limited. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) DS5.2: Although security-relevant information is produced by systems, it is not analysed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) DS5.2: Services from third parties may not address the specific security needs of the organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) DS5.2: Security policies are being developed, but skills and tools are inadequate. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) DS5.2: IT security reporting is incomplete, misleading or not pertinent. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) DS5.2: Security training is available but is undertaken primarily at the initiative of the individual. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) DS5.2: IT security is seen primarily as the responsibility and domain of IT and the business does not see IT security as within its domain. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) DS5.3: Security awareness exists and is promoted by management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) DS5.3: IT security procedures are defined and aligned with IT security policy. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) DS5.3: Responsibilities for IT security are assigned and understood, but not consistently enforced. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) DS5.3: An IT security plan and security solutions exist as driven by risk analysis. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) DS5.3: Reporting on security does not contain a clear business focus. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) DS5.3: Ad hoc security testing (e.g., intrusion testing) is performed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

25) DS5.3: Security training is available for IT and the business, but is only informally scheduled and managed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

26) DS5.4: Responsibilities for IT security are clearly assigned, managed and enforced. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

27) DS5.4: IT security risk and impact analysis is consistently performed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

28) DS5.4: Security policies and procedures are completed with specific security baselines. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

29) DS5.4: Exposure to methods for promoting security awareness is mandatory. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

30) DS5.4: User identification, authentication and authorisation are standardised. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

31) DS5.4: Security certification is pursued for staff members who are responsible for the audit and management of security. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

32) DS5.4: Security testing is completed using standard and formalised processes, leading to improvements of security levels. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

33) DS5.4: IT security processes are co-ordinated with an overall organisation security function. IT security reporting is linked to business objectives. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

34) DS5.4: IT security training is conducted in both the business and IT. IT security training is planned and managed in a manner that responds to business needs and defined security risk profiles. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

35) DS5.5: IT security is a joint responsibility of business and IT management and is integrated with corporate security business objectives. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

36) DS5.5: IT security requirements are clearly defined, optimised and included in an approved security plan. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

37) DS5.5: Users and customers are increasingly accountable for defining security requirements, and security functions are integrated with applications at the design stage. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

38) DS5.5: Security incidents are promptly addressed with formalised incident response procedures supported by automated tools. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

39) DS5.5: Periodic security assessments are conducted to evaluate the effectiveness of the implementation of the security plan. Information on threats and vulnerabilities is systematically collected and analysed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

40) DS5.5: Adequate controls to mitigate risks are promptly communicated and implemented. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

41) DS5.5: Security testing, root cause analysis of security incidents and proactive identification of risk are used for continuous process improvements. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

42) DS5.5: Security processes and technologies are integrated organisationwide. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

43) DS5.5: Metrics for security management are measured, collected and communicated. Management uses these measures to adjust the security plan in a continuous improvement process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

DS10: Manage Problems

---

1) DS10.0: There is no awareness of the need for managing problems, as there is no differentiation of problems and incidents. Therefore, there is no attempt made to identify the root cause of incidents. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) DS10.1: Personnel recognise the need to manage problems and resolve underlying causes. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) DS10.1: Key knowledgeable personnel provide some assistance with problems relating to their area of expertise, but the responsibility for problem management is not assigned. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) DS10.1: Information is not shared, resulting in additional problem creation and loss of productive time while searching for answers. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) DS10.2: There is a wide awareness of the need for and benefits of managing IT-related problems within both the business units and information services function. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) DS10.2: The resolution process is evolved to a point where a few key individuals are responsible for identifying and resolving problems. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) DS10.2: Information is shared amongst staff in an informal and reactive way. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) DS10.2: The service level to the user community varies and is hampered by insufficient, structured knowledge available to the problem manager. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) DS10.3: The need for an effective integrated problem management system is accepted and evidenced by management support, and budgets for the staffing and training are available. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) DS10.3: The need for an effective integrated problem management system is accepted and evidenced by management support, and budgets for the staffing and training are available. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) DS10.3: Problem resolution and escalation processes have been standardised. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) DS10.3: The recording and tracking of problems and their resolutions are fragmented within the response team, using the available tools without centralisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) DS10.3: Deviations from established norms or standards are likely to be undetected. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) DS10.3: Information is shared among staff in a proactive and formal manner. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) DS10.3: Management review of incidents and analysis of problem identification and resolution are limited and informal. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) DS10.4: The problem management process is understood at all levels within the organisation. Responsibilities and ownership are clear and established. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) DS10.4: Methods and procedures are documented, communicated and measured for effectiveness. The majority of problems are identified, recorded and reported, and resolution is initiated. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) DS10.4: Knowledge and expertise are cultivated, maintained and developed to higher levels, as the function is viewed as an asset and major contributor to the achievement of IT objectives and improvement of IT services. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) DS10.4: Problem management is well integrated with interrelated processes, such as incident, change, availability and configuration management, and assists customers in managing data, facilities and operations. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) DS10.5: The problem management process is evolved into a forward-looking and proactive one, contributing to the IT objectives. Problems are anticipated and prevented. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) DS10.5: Knowledge regarding patterns of past and future problems is maintained through regular contacts with vendors and experts. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) DS10.5: The recording, reporting and analysis of problems and resolutions are automated and fully integrated with configuration data management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) DS10.5: Most systems have been equipped with automatic detection and warning mechanisms, which are continuously tracked and evaluated. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) DS10.5: The problem management process is analysed for continuous improvement based on analysis of measures and is reported to stakeholders. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

DS11: Manage Data

---

1) DS11.0: Data are not recognised as corporate resources and assets. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) DS11.0: There is no assigned data ownership or individual accountability for data management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) DS11.0: There is no assigned data ownership or individual accountability for data management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) DS11.0: Data quality and security are poor or non-existent. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) DS11.1: The organisation recognises a need for effective data management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) DS11.1: There is an ad hoc approach for specifying security requirements for data management, but no formal communications procedures are in place. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) DS11.1: No specific training on data management takes place. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) DS11.1: Responsibility for data management is not clear. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) DS11.1: Backup/restoration procedures and disposal arrangements are in place. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) DS11.2: The awareness of the need for effective data management exists throughout the organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) DS11.2: Data ownership at a high level begins to occur. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) DS11.2: Security requirements for data management are documented by key individuals. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) DS11.2: Some monitoring within IT is performed on data management key activities (e.g., backup, restoration, disposal). How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) DS11.2: Responsibilities for data management are informally assigned for key IT staff members. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) DS11.3: The need for data management within IT and across the organisation is understood and accepted. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) DS11.3: Responsibility for data management is established. Data ownership is assigned to the responsible party who controls integrity and security. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) DS11.3: Data management procedures are formalised within IT, and some tools for backup/restoration and disposal of equipment are used. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) DS11.3: Some monitoring over data management is in place. Basic performance metrics are defined. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) DS11.3: Training for data management staff members is emerging. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) DS11.4: The need for data management is understood, and required actions are accepted within the organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) DS11.4: Responsibility for data ownership and management are clearly defined, assigned and communicated within the organisation. Procedures are formalised and widely known, and knowledge is shared. Usage of current tools is emerging. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) DS11.4: Goal and performance indicators are agreed to with customers and monitored through a well-defined process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) DS11.4: Formal training for data management staff members is in place. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) DS11.5: The need for data management and the understanding of all required actions is understood and accepted within the organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

25) DS11.5: The responsibilities for data ownership and data management are clearly established, widely known across the organisation and updated on a timely basis. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

26) DS11.5: Procedures are formalised and widely known, and knowledge sharing is standard practice. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

27) DS11.5: Sophisticated tools are used with maximum automation of data management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

28) DS11.5: Goal and performance indicators are agreed to with customers, linked to business objectives and consistently monitored using a well-defined process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

ME1: Monitor and Evaluate IT Performance

---

1) ME1.0: The organisation has no monitoring process implemented. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

2) ME1.0: IT does not independently perform monitoring of projects or processes. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

3) ME1.0: Useful, timely and accurate reports are not available. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) ME1.0: The need for clearly understood process objectives is not recognised. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) ME1.1: Management recognises a need to collect and assess information about monitoring processes. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) ME1.1:Standard collection and assessment processes have not been identified. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) ME1.1: Monitoring is implemented and metrics are chosen on a case-by-case basis, according to the needs of specific IT projects and processes. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) ME1.1: Monitoring is generally implemented reactively to an incident that has caused some loss or embarrassment to the organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) ME1.2: Basic measurements to be monitored are identified. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) ME1.2: Collection and assessment methods and techniques exist, but the processes are not adopted across the entire organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) ME1.2: Interpretation of monitoring results is based on the expertise of key individuals. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) ME1.2: Limited tools are chosen and implemented for gathering information, but the gathering is not based on a planned approach. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) ME1.3: Management communicates and institutes standard monitoring processes. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) ME1.3: Educational and training programmes for monitoring are implemented. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) ME1.3: A formalised knowledge base of historical performance information is developed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) ME1.3: Assessment is still performed at the individual IT process and project level and is not integrated amongst all processes. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) ME1.3: Measurements of the contribution of the information services function to the performance of the organisation are defined, using traditional financial and operational criteria. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) ME1.3: IT-specific performance measurements, non-financial measurements, strategic measurements, customer satisfaction measurements and service levels are defined. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) ME1.3: A framework is defined for measuring performance. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) ME1.4: Management defines the tolerances under which processes must operate. Reporting of monitoring results is being standardised and normalised. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) ME1.4: There is integration of metrics across all IT projects and processes. The IT organisation's management reporting systems are formalised. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) ME1.4: Automated tools are integrated and leveraged organisationwide to collect and monitor operational information on applications, systems and processes. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) ME1.4: Management is able to evaluate performance based on agreed-upon criteria approved by stakeholders. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) ME1.4: Measurements of the IT function align with organisationwide goals. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

25) ME1.5: A continuous quality improvement process is developed for updating organisationwide monitoring standards and policies and incorporating industry good practices. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

26) ME1.5: All monitoring processes are optimised and support organisationwide objectives. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

27) ME1.5: Businessdriven metrics are routinely used to measure performance and are integrated into strategic assessment frameworks, such as the IT balanced scorecard. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

28) ME1.5: Process monitoring and ongoing redesign are consistent with organisationwide business process improvement plans. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

ME2: Monitor and Evaluate Internal Control

---

1) Organisation

_____

2) Title

_____

3) ME2.0: The organisation lacks procedures to monitor the effectiveness of internal controls. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) ME2.0: Management internal control reporting methods are absent. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) ME2.0: There is a general unawareness of IT operational security and internal control assurance. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) ME2.0: Management and employees have an overall lack of awareness of internal controls. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) ME2.1: Management recognises the need for regular IT management and control assurance. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) ME2.1: Individual expertise in assessing internal control adequacy is applied on an ad hoc basis. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) ME2.1: IT management has not formally assigned responsibility for monitoring the effectiveness of internal controls. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) ME2.1: IT internal control assessments are conducted as part of traditional financial audits, with methodologies and skill sets that do not reflect the needs of the information services function. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) ME2.2: The organisation uses informal control reports to initiate corrective action initiatives. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) ME2.2: Internal control assessment is dependent on the skill sets of key individuals. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) ME2.2: The organisation has an increased awareness of internal control monitoring. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) ME2.2: Information service management performs monitoring over the effectiveness of what it believes are critical internal controls on a regular basis. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) ME2.2: Methodologies and tools for monitoring internal controls are starting to be used, but not based on a plan. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) ME2.2: Risk factors specific to the IT environment are identified based on the skills of individuals. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) ME2.3: Management supports and institutes internal control monitoring. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) ME2.3: Policies and procedures are developed for assessing and reporting on internal control monitoring activities. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) ME2.3: An education and training programme for internal control monitoring is defined. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) ME2.3: A process is defined for self-assessments and internal control assurance reviews, with roles for responsible business and IT managers. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) ME2.3: Tools are being utilised but are not necessarily integrated into all processes. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) ME2.3: IT process risk assessment policies are being used within control frameworks developed specifically for the IT organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) ME2.4: Management implements a framework for IT internal control monitoring. The organisation establishes tolerance levels for the internal control monitoring process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) ME2.4: Tools are implemented to standardise assessments and automatically detect control exceptions. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

25) ME2.4: A formal IT internal control function is established, with specialised and certified professionals utilising a formal control framework endorsed by senior management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

26) ME2.4: Skilled IT staff members are routinely participating in internal control assessments. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

27) ME2.4: A metrics knowledge base for historical information on internal control monitoring is established. Peer reviews for internal control monitoring are established. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

28) ME2.5: Management establishes an organisationwide continuous improvement programme that takes into account lessons learned and industry good practices for internal control monitoring. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

29) ME2.5: The organisation uses integrated and updated tools, where appropriate, that allow effective assessment of critical IT controls and rapid detection of IT control monitoring incidents. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

30) ME2.5: Knowledge sharing specific to the information services function is formally implemented. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

ME4: Provide IT Governance

---

1) Organisation

_____

2) Title

_____

3) ME4.0: There is a complete lack of any recognisable IT governance process. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

4) ME4.1: There is recognition that IT governance issues exist and need to be addressed. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

5) ME4.1: There are ad hoc approaches applied on an individual or case-by-case basis. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

6) ME4.1: Management's approach is reactive, and there is only sporadic, inconsistent communication on issues and approaches to address them. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

7) ME4.1: Management has only an approximate indication of how IT contributes to business performance. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

8) ME4.1: Management only reactively responds to an incident that has caused some loss or embarrassment to the organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

9) ME4.2: There is awareness of IT governance issues. IT governance activities and performance indicators, which include IT planning, delivery and monitoring processes, are under development. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

10) ME4.2: Selected IT processes are identified for improvement based on individuals' decisions. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

11) ME4.2: Management identifies basic IT governance measurements and assessment methods and techniques; however, the process is not adopted across the organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

12) ME4.2: Communication on governance standards and responsibilities is left to the individual. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

13) ME4.2: Individuals drive the governance processes within various IT projects and processes. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

14) ME4.2: The processes, tools and metrics to measure IT governance are limited and may not be used to their full capacity due to a lack of expertise in their functionality. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

15) ME4.3: The importance of and need for IT governance are understood by management and communicated to the organisation. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

16) ME4.3: A baseline set of IT governance indicators is developed where linkages between outcome measures and performance indicators are defined and documented. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

17) ME4.3: Procedures are standardised and documented. Management communicates standardised procedures, and training is established. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

18) ME4.3: Tools are identified to assist with overseeing IT governance. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

19) ME4.3: Dashboards are defined as part of the IT balanced business scorecard. However, it is left to the individual to get training, follow the standards and apply them. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

20) ME4.3: Processes may be monitored, but deviations, while mostly being acted upon by individual initiative, are unlikely to be detected by management. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

21) ME4.4: There is full understanding of IT governance issues at all levels. There is a clear understanding of who the customer is, and responsibilities are defined and monitored through SLAs. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

22) ME4.4: Responsibilities are clear and process ownership is established. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

23) ME4.4: IT processes and IT governance are aligned with and integrated into the business and the IT strategy. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

24) ME4.4: Improvement in IT processes is based primarily upon a quantitative understanding, and it is possible to monitor and measure compliance with procedures and process metrics. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

25) ME4.4: All process stakeholders are aware of risks, the importance of IT and the opportunities it can offer. Management defines tolerances under which processes must operate. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

26) ME4.4: There is limited, primarily tactical, use of technology, based on mature techniques and enforced standard tools. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

27) ME4.4: IT governance has been integrated into strategic and operational planning and monitoring processes. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

28) ME4.4: Performance indicators over all IT governance activities are being recorded and tracked, leading to enterprisewide improvements. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

29) ME4.4: Overall accountability of key process performance is clear, and management is rewarded based on key performance measures. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

30) ME4.5: There is an advanced and forward-looking understanding of IT governance issues and solutions. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

31) ME4.5: Training and communication are supported by leading-edge concepts and techniques. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

32) ME4.5: Processes are refined to a level of industry good practice, based on results of continuous improvement and maturity modelling with other organisations. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

33) ME4.5: The implementation of IT policies leads to an organisation, people and processes that are quick to adapt and fully support IT governance requirements. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

34) ME4.5: All problems and deviations are root cause analysed, and efficient action is expediently identified and initiated. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

35) ME4.5: Monitoring, self-assessment and communication about governance expectations are pervasive within the organisation, and there is optimal use of technology to support measurement, analysis, communication and training. How much do you agree?

( ) Not at all

( ) A little

( ) Quite a lot

( ) Completely

PROCESS ASSESSMENT RESULTS

Organisation Name: XXXXXX

Process Name	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
Plan and Organise						
PO1 Define a strategic IT plan.						
PO2 Define the information architecture.						
PO3 Determine technological direction.						
PO4 Define the IT processes, organisation and						
PO5 Manage the IT investment.						
PO6 Communicate management aims and direction.						
PO7 Manage IT human resources.						
PO8 Manage quality.						
PO9 Assess and manage IT risks.						
PO10 Manage projects.						
Acquire and Implement						
AI1 Identify automated solutions.						
AI2 Acquire and maintain application software.						
AI3 Acquire and maintain technology infrastructure.						
AI4 Enable operation and use.						
AI5 Procure IT resources.						
AI6 Manage changes.						
AI7 Install and accredit solutions and changes.						
Deliver and Support						
DS1 Define and manage service levels.						
DS2 Manage third-party services.						
DS2 Manage performance and capacity.						
DS4 Ensure continuous service.						
DS5 Ensure systems security.						
DS6 Identify and allocate costs.						
DS7 Educate and train users.						
DS8 Manage service desk and incidents.						
DS9 Manage the configuration.						
DS10 Manage problems.						
DS11 Manage data.						
DS12 Manage the physical environment.						
DS13 Manage operations.						
Monitor and Evaluate						
ME1 Monitor and evaluate IT performance.						
ME2 Monitor and evaluate internal control.						
ME3 Ensure compliance with external requirements.						

Appendix B: Consent to participation in research

Title of project: IT Governance Practice in Kingdom of Bahrain

I have been given and have understood an explanation of this research. I have had an opportunity to ask questions and have them answered to my satisfaction. I understand that I may withdraw myself (or any information I have provided) from this research (before data collection and analysis is complete) without having to give reasons.

I understand that any information I provide will be kept confidential to the researcher, the supervisor and advisor, the published results will not use my name, and that no opinions will be attributed to me in any way that will identify me. I understand that the tape recording of interviews will be electronically wiped at the end of the project unless I indicate that I would like them returned to me.

Please tick the appropriate boxes:

☐ I consent to information or opinions which I have given being attributed to me in any reports on this research.

☐ I would like the tape recordings of my interview returned to me at the conclusion of the project.

☐ I understand that I will have an opportunity to check the transcripts of the interview before publication.

☐ I understand that the data I provide will not be used for any other purpose or released to others without my written consent.

☐ I would like to receive a summary of the results of this research when it is completed.

☐ I agree to take part in this research

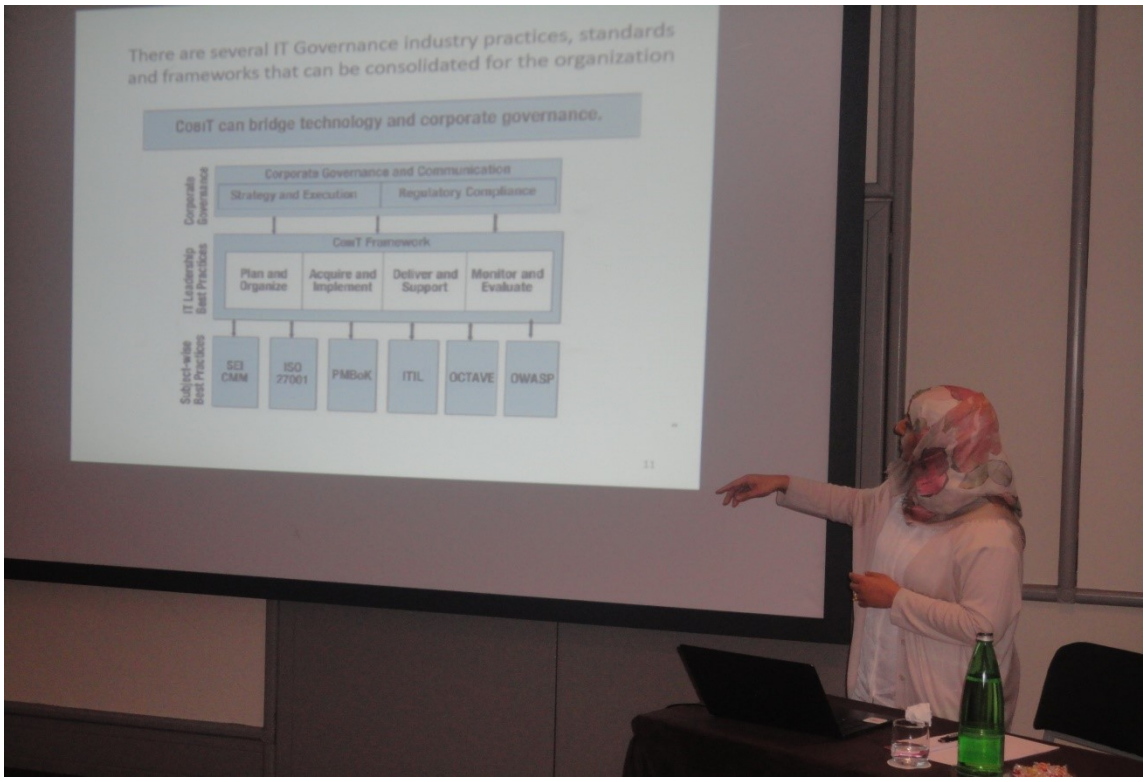
Signed: Date:

Name of participant:

Appendix C: Participation at Conferences

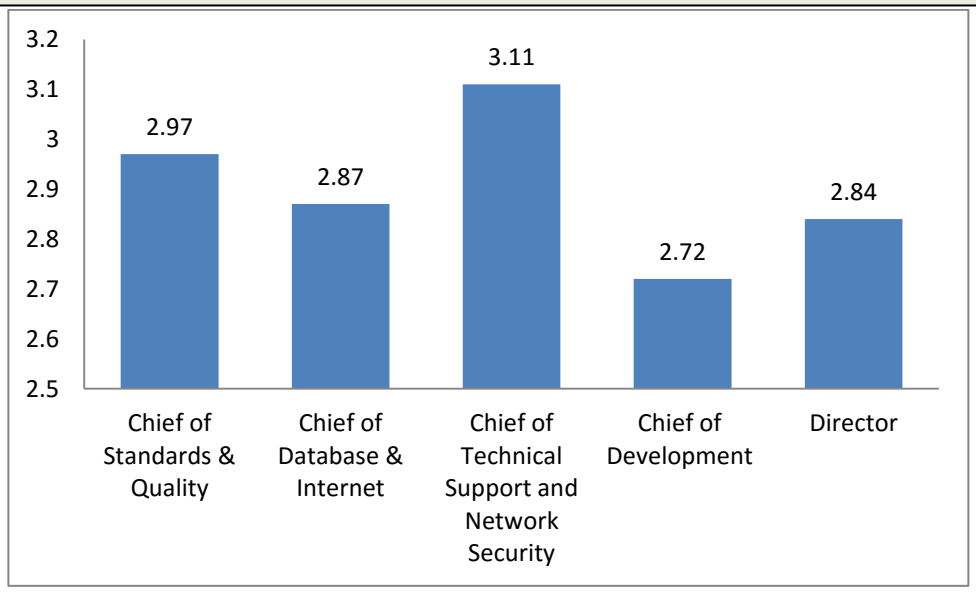
BCS Conference

WSCAR Conference



FGCT conference

Appendix D: SHIP-ITG Model test result.



These figures present the answers obtained from five senior colleagues in the IT Directorate from MoE.